LAUDA

Operating Instructions

ECOLINE ★ STAREDITION

Low-temperature thermostats
RE 204, RE 205,
RE 206, RE 207,
RE 210, RE 212, RE 220

LAUDA DR. R. WOBSER
GMBH & CO. KG
Post-office box 1251
97912 Lauda-Koenigshofen
Germany
Phone: 0049 9343/ 503-0
Fax: 0049 9343/ 503-222
E-mail info@lauda.de
Internet http://www.lauda.de

Valid from series 04-0001 (see item 8.4)
02/2009 replaces 02/2008, 08/2005
from software version 4.0
YACE0060

eingefl. ÄA 05/027, 06/052, 06/089, 07/122, 07/164, 08/031, 08/127.

Prefixed safety notes

Before operating the equipment please read carefully all the instructions and safety notes. If you have any questions please phone us! (⇨ 8.4)

Follow the instructions on setting up, operation etc. This is the only way to avoid incorrect operation of the equipment and to ensure full warranty protection.

- Transport the equipment with care!
- The unit may NEVER be overturned nor put upside down!

  Equipment and its internal parts can be damaged:

  – by dropping

  – by shock.
- Equipment must only be operated by technically qualified personnel!
- Never operate the equipment without the heat transfer liquid (= bath liquid)!
- Do not start up the equipment if:

  – it is damaged or leaking,

  – the supply cable is damaged.
- Switch off the equipment and pull out the mains plug:

  – for servicing or repair,

  – before moving the equipment!
- Drain the bath before moving the equipment!
- Have the equipment serviced or repaired by properly qualified personnel only!

The Operating Instructions include additional safety notes which are identified by a triangle with an exclamation mark. Carefully read the instructions and follow them accurately! Disregarding the instructions may have serious consequences, such as damage to the equipment, damage to property or injury to personnel!

We reserve the right to make technical alterations!

Table of contents

PREFIXED SAFETY NOTES ... 3

1 SAFETY NOTES ... 6

1.1 GENERAL SAFETY NOTES ... 6
1.2 OTHER SAFETY NOTES ... 7

2 BRIEF OPERATING INSTRUCTIONS ... 8

3 CONTROL AND FUNCTIONAL ELEMENTS ... 10

4 UNIT DESCRIPTION ... 11

4.1 ENVIRONMENTAL CONDITIONS ... 11
4.2 UNIT TYPES ... 11
4.3 BATHS ... 11
4.4 PUMPS ... 11
4.5 MATERIALS ... 12
4.6 TEMPERATURE INDICATION, CONTROL AND SAFETY CIRCUIT ... 12
4.7 PROGRAMMER ... 12
4.8 INTERFACES ... 12
4.9 REFRIGERATION SYSTEM ... 13

5 UNPACKING ... 14

6 PREPARATIONS ... 15

6.1 ASSEMBLY AND SETTING UP ... 15
6.2 FILLING AND EMPTYING ... 16
6.3 BATH LIQUIDS AND HOSE CONNECTIONS ... 17
6.4 CONNECTION OF EXTERNAL CIRCUITS ... 19

7 STARTING UP ... 20

7.1 CONNECTION TO THE SUPPLY ... 20
7.2 SWITCHING ON ... 20
7.3 SET POINT SELECTION (LEVEL 0) ... 21
7.4 MENU FUNCTIONS ... 21
7.4.1 Refrigeration system (level 1) ... 22
7.4.2 Pump output ... 22
7.4.3 Setting the set point resolution ... 23
7.4.4 Programmer level (PGM) ... 24
7.4.4.1 Programme example ... 24
7.4.4.2 Indicating/ altering of programme segments ... 25
7.4.4.3 Number of programme running ... 26
7.4.4.4 Starting of the programmer ... 27
7.4.4.5 Inserting/ deleting of program segments ... 28
7.4.4.6 Holding/ continuing the programme ... 30
7.4.4.7 Terminating the programme ... 31
7.4.5 Parameters ... 31
7.4.5.1 Setting the proportional band of the PID-controller ... 32
7.4.5.2 Setting the reset time of the PID-controller ... 32
7.4.5.3 Selection of the interface ... 33
7.4.5.4 Setting the Baud rate/ transfer rate (serial interface) ... 34
7.4.5.5 User calibration ... 34
7.5 WARNING AND SAFETY FUNCTIONS ... 36
7.5.1 Overtemperature protection and testing ... 36
7.5.2 Low-level protection and testing ... 37
7.5.3 Pump motor monitoring ... 37
7.5.4 Connection floating contact "Combination fault" 31 N ... 38

7.5.5 Other error messages 38
7.6 SERIAL INTERFACES RS 232, RS 485 39
7.6.1 RS 232 Interface 39
7.6.2 RS 485 Interface 40
7.6.3 Write commands (data commands to the thermostat) 41
7.6.4 Read commands (data requested from the thermostat) 42
7.6.5 Error messages 42
7.6.6 Driver software for LABVIEW® 42

8 MAINTENANCE 43

8.1 CLEANING 43
8.2 MAINTENANCE AND REPAIR 43
8.2.1 Testing the heat transfer liquid 43
8.2.2 Maintenance of the refrigeration unit 44
8.3 DISPOSAL INFORMATION 44
8.3.1 Disposal of the refrigerant 44
8.3.2 Disposal of the packaging 45
8.3.3 Note on repair 45
8.4 ORDERING SPARES 46

9 ACCESSORIES 47

10 TECHNICAL DATA 48

11 CIRCUIT DIAGRAMS 52

12 PIPE PLAN 56

CONFIRAMTION 61

Explanation of signs:

	Danger:	This sign is used where there may be injury to personnel if a recommendation is not followed accurately or is disregarded.
	Note:	Here special attention is drawn to some aspect. May include reference to danger.
	Reference:	Refers to other information in different sections.

1 Safety notes

1.1 General safety notes

A laboratory thermostat is intended for heating and pumping liquids according to the needs of the user. This leads to hazards by high temperatures, fire, and the general hazards by the use of electrical energy.

The user is largely protected through the application of the appropriate standard specifications.

Additional hazards may arise from the type of material being thermostated, e.g. when going above or below certain temperature levels or through breaking of the container and reaction with the heat carrier liquid.
It is not possible to cover all possibilities; they remain largely within the responsibility and the judgement of the user.

The unit must only be used as intended and as described in these Operating Instructions. This includes operation by suitably instructed qualified personnel.

The units are not designed for use under medical conditions according to DIN EN 60601-1 or IEC 601-1!

Electrical equipment for measurement, control and laboratory use -
EMC requirements DIN EN 61326-1

Class A: Operation only on networks without connected domestic areas.
Class B: Equipment for operation on networks with connected domestic areas.

For Europe only:
The equipment according to EMC (electromagnetic compatibility) requirements DIN EN 61326-1 VDE 0843-20-1 (⇨ 10).

Use restriction
To EMC standard DIN EN 61326-1:
Class A devices must not be operated by in power networks with connected domestic areas!

For the USA only:
Instructions for Class A digital devices
“This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to Part 15 of the FCC (Federal Communication Commission) Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.”
“This device complies with Part 15 of the FCC (Federal Communication Commission) Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.”

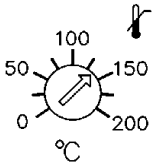
For Canada only:
“This Class A digital apparatus complies with Canadian ICES-003” (ICES = Interference Causing Equipment Standards).
« Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada ».

1.2 Other safety notes

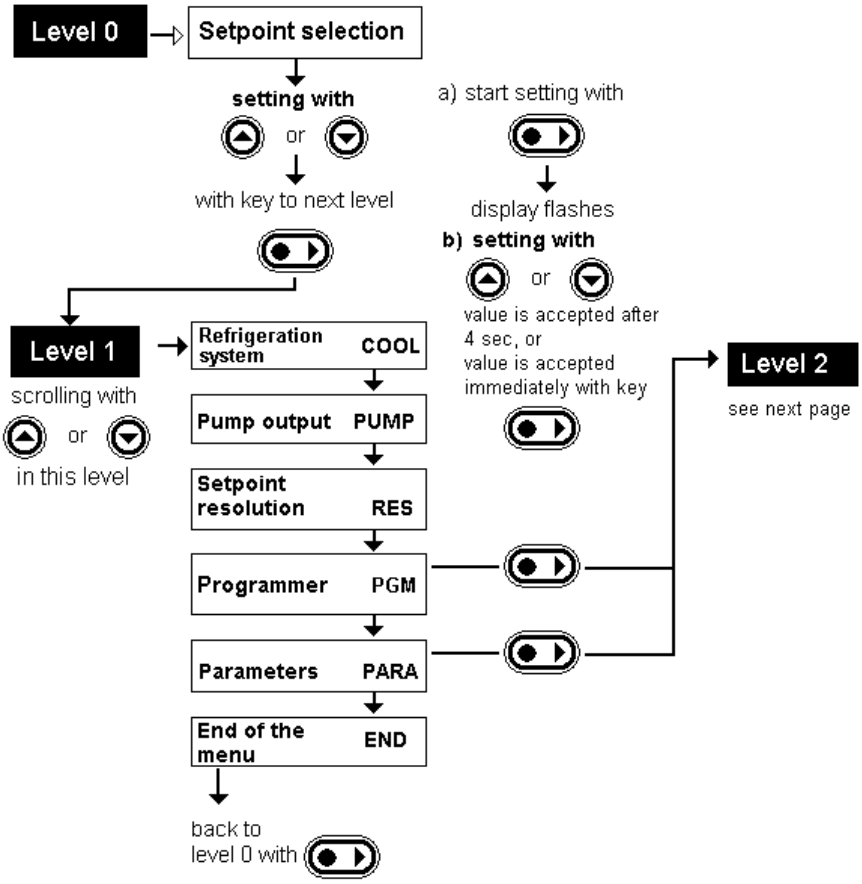
- Connect the unit only to grounded mains power socket (PE).
- Parts of the bath cover may reach surface temperatures above 70 °C when operating at higher temperatures. Take care when touching it!
- Use suitable hoses ⇨ 6.3
- Protect hoses with hose clips against slipping off. Avoid kinks in the hoses!
- Check hoses from time to time for possible material defects!
- Heat transfer tubing and other hot parts must not come into contact with the supply cable!
- When using the thermostat as circulation thermostat, failure of tubing may lead to leaking of hot heat transfer liquid and become a danger to personnel and objects.
- When no external consumer is connected to the thermostat the pump outflow must be closed (use closing plugs) or linked to the return!
- Allow for expansion of the bath oils at elevated temperatures!
- Depending on the bath liquid used and the mode of operation it is possible for toxic vapours to be produced. Ensure appropriate ventilation!
- When changing the bath liquid from water to oil, for temperatures above 100 °C, carefully remove all traces of water, also from tubing and from the external consumer, otherwise → danger of burns through delayed boiling!
- Always pull out the mains plug before cleaning, maintenance or moving the thermostat!
- Repairs on the control unit and the refrigeration system must be carried out by properly qualified personnel only!
- Values for temperature control and indicating accuracy apply under normal conditions according to DIN 12876. High-frequency electromagnetic fields may under special conditions lead to unfavourable values. This does not affect the safety!

2 Brief operating instructions

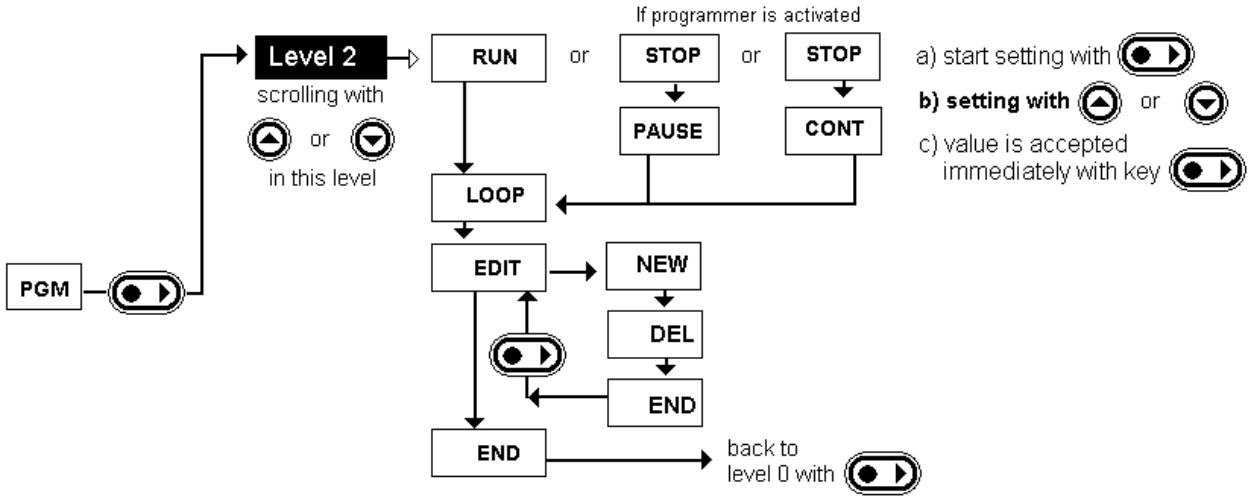
This brief instruction shall give you the possibility to operate the unit quickly. For safe operation of the unit it is absolutely necessary to read carefully all the instructions and safety notes!

1. Assemble unit and add items as appropriate (⇨ 6).
   Take care of the hose tubing connections (⇨ 6.1 and 6.4).
2. Fill the unit with corresponding liquid (⇨ 6.3). The units are designed for operation with non-flammable and flammable liquids to DIN EN 61010-2-010 IEC 61010-2-010. → Take care of the level of the bath liquid! (⇨ 6.2)
3. Connect the unit only to a socket with a protective earth (PE) connection.
   Compare the information on the rating label with the supply details.
4. 

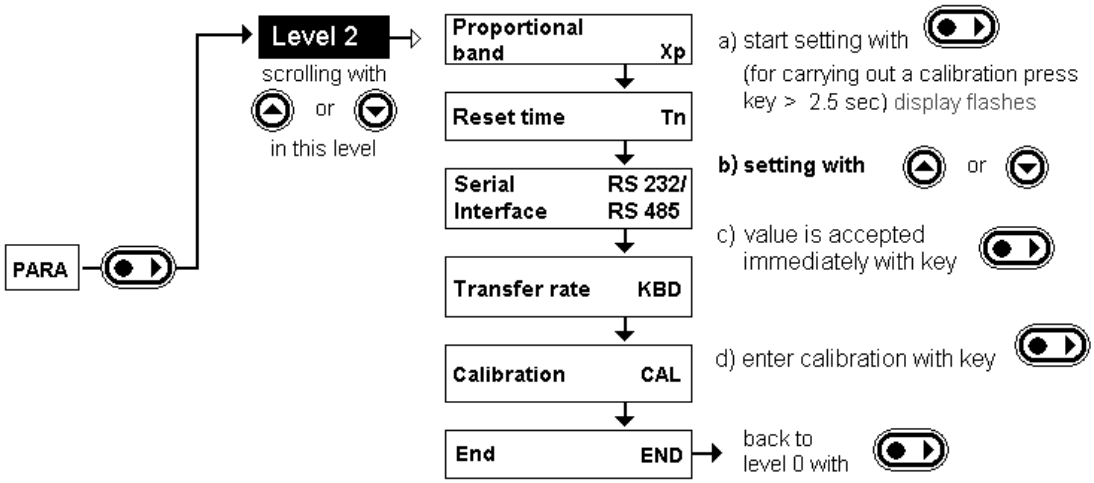
   Set the over temperature cut-out point to a value clearly above ambient temperature (⇨ 7.5.1).
5. Switch on at the mains switch
6. Setting of the functions



Refrigeration system COOL ⇨ 7.4.1
Pump output PUMP ⇨ 7.4.2
Setpoint resolution RES ⇨ 7.4.3



Programmer PGM ⇨ 7.4.4



Parameters PARA ⇨ 7.4.5

3 Control and functional elements

LED green, Supply ON

Menu functions

Pump connections:
– return to bath
– pump outflow, pressure output
(⇨ labelling housing)

Bath bridge

Setting of the over temperature switch-off point

Mains switch

Bath cover

RS 232/485 65S

Alarm contact 31N

4 Unit description

4.1 Environmental conditions

The operation of the thermostats is only allowed under the following conditions as specified in DIN EN 61010-2-010:2003 and DIN EN 61010-1:2001.

- Indoor use.
- Altitude up to 2000 m above sea level.
- Foundation must be dense, even, non-slippery and non-flammable.
- Keep clear distance (⇨ 6.1 Assembly and setting up).
- Ambient temperature range (⇨ 10).
  Use only within this range for an undisturbed operation.
- Mains supply voltage fluctuations (⇨ 10).
- Maximum relative humidity 80 % for temperatures up to 31 °C, decreasing linearly to 50 % relative humidity at 40 °C.
- Transient over voltage according to Installation Categories (Over voltage Categories) II
- Pollution degree: 2.

4.2 Unit types

The type designation of the Ecoline low-temperature thermostats consists of the letter R (identification as low-temperature unit), the control unit E 200 and the type of bath and refrigeration system.

Example: Control unit E 200 and bath RE 004 produces Thermostat Type RE 204.

Type RE 220 is supplied without bath cover. A bath cover is available as accessory (⇨ 9).

4.3 Baths

All units provide a stainless steel bath. The last two digits of the model no. correspond to the approximate total volume in Litres (e.g. bath RE 206 = approx. 6 Litre).

Part of this volume may be used to insert objects.

Exception!
Model no. RE 205 was especially optimised for tempering external vessels and therefore does not provide any usable bath volume for inserting objects.

4.4 Pumps

All units are equipped with a pressure pump with vario drive. The pump has an outflow with a rotatable bend which is connected to the pump nipple for external thermostating units. An additional outflow provides circulation inside the bath. By turning the setting knob it is possible to choose between both outlets or to divide the flows.

The pump can be used for viscosities up to 150 mm²/s. However, to get an optimum accuracy of control a viscosity of < 30 mm²/s is recommended.

One of five pump output steps can be selected using the operating menu.
On small low-temperature thermostats (e.g. RE 204 or RE 206) and with operation as bath thermostat it is advisable to use output step 2. The advantage is a low heat generation while having a uniform circulation that means, that the thermostat can work without cooling down to just above ambient temperature.

When operating as circulation thermostat with an external circuit it is preferable to use a larger flow rate in order to ensure a small temperature difference, especially at higher temperatures and in conjunction with oil as the bath liquid.

The pump connection outflow can be closed off without causing any damage to the pump.

Pump characteristics (⇨ 10 Technical Data)

4.5 Materials

All parts which come into contact with the bath liquid are made from high-grade materials appropriate to the operating temperature. These are rust-free stainless steel, PPS plastics and fluoride rubber.

4.6 Temperature indication, control and safety circuit

The unit is equipped with a 2-line LCD-Display with additional symbols for indicating bath temperature and settings as well as operating states. The input of the set point and other additional adjustments are done using either two or three keys.

Remote operation is possible via an electrically isolated RS 232 interface.

A Pt100 temperature probe is used for measuring the actual temperature and for control. A second Pt100 serves as temperature probe for the safety circuit (over temperature protection) which is independent of the control function.

A low-level protection switches off the heating on both poles in order to prevent dry operation of the heater. The pump is switched off electronically. The over temperature switch-off point is adjusted with a tool on a potentiometer and is always limited to 5 °C above the operating temperature range. A floating contact "Combination fault" is available.

All settings and fault messages are stored in the memory in case of a supply failure or when the mains switch is set to “OFF”.

The tubular heater is controlled from a modified PID controller through a triac circuit specially designed to be unaffected by supply variations and interference.

4.7 Programmer

The units incorporate a programmer which can be used to run temperature programmes with up to 20 temperature-time-segments (⇨ 7.4.4).

4.8 Interfaces

Connector for fault (alarm) contact output and a serial RS 232/ RS 485 interface are located on the back of the control head.

For further description of the interfaces see under Section 7.6 and 7 Starting up.

4.9 Refrigeration system

The refrigeration system consists essentially of a hermetically sealed compressor. Heat of condensation and motor heat are dissipated by a fan-cooled finned condenser. Fresh air is drawn in at the front of the unit; warmed air is discharged at the back and to the sides. The ventilation openings must not be restricted in order to ensure proper air circulation.

At working temperatures below approx. 30 °C the refrigeration system operates continuously to remove a certain amount of heat, with the heater acting in opposition to provide automatically controlled heating power.

The compressors are fitted with a temperature monitor which responds both to the compressor temperature and to the motor current. In addition the cooling system is protected against excessive pressure by a pressure monitor. The refrigeration unit is switched on either automatically or manually through the operating menu (⇨ 7.4.1).

Types RE 205, RE 207, RE 210, RE 212, RE 220 are additionally provided with a cooling capacity adjustment which saves energy in many operating situations, reduces the load on the refrigeration system and produces a better temperature control. This feature, too, can be operated either automatically or manually.

When the fault circuit is activated the refrigeration system is also switched off.

Cooling curves (⇨ 10 Technical Data)

5 Unpacking

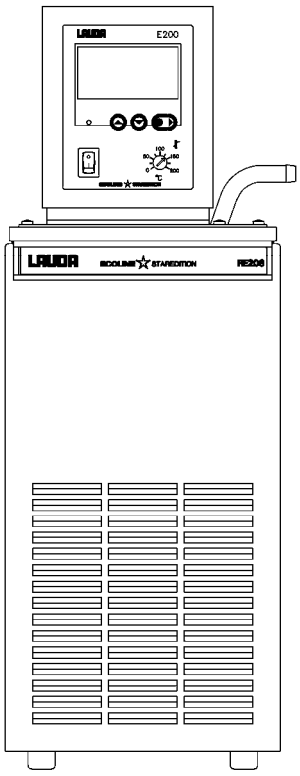
After the unit and accessories have been unpacked they have to be examined for possible transport damage. If there is any damage visible on the unit, the forwarding agent or the post office has to be notified so that the shipment can be examined.
Please also inform the LAUDA Service Constant Temperature Equipment (Contact ⇨ 8.4).

Standard accessories:

Article number	Quantity	Designation	
		Bath cover	except RE 220
HDQ 084	1	Bath cover RE 004	only with RE 204
HDQ 086	1	Bath cover RE 012	only with RE 205, RE 210 and RE 212
HDQ 085	1	Bath cover FBC 020	only with RE 206 and RE 207
UD 435	1	Closing plug	for all low-temperature thermostats
EZB 260	1	Warning label “HOT”	for all low-temperature thermostats
YACE 0060	1	Operating Instructions (this document)	for all low-temperature thermostats

6 Preparations

6.1 Assembly and setting up



– Place the unit on a flat surface.

– The unit may NEVER be overturned or put upside down!

– After transport and before starting up, store it standing in upright position for two hours if possible.

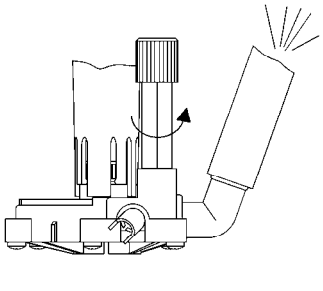
– Do not cover the ventilation openings at the back of the unit and its lower part. Keep clear distance of at least 40 cm.

– Adjust the flow setting knob so that when using the unit as bath thermostat (no external circulation) the flow emerges at the opening for the bath circulation, or link together the pump connections (see ill. 3).

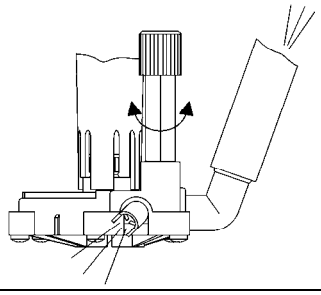
Operation with external consumer
(circulation thermostat) (⇨ 6.4)

Adjustments of the pump outflows (⇨ 6.4)

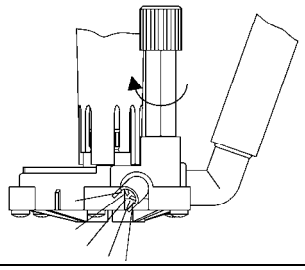
Ill 1
Flow setting knob turned anticlockwise



Ill 1
Flow setting knob medium position



Ill 3.
Flow setting knob turned clockwise



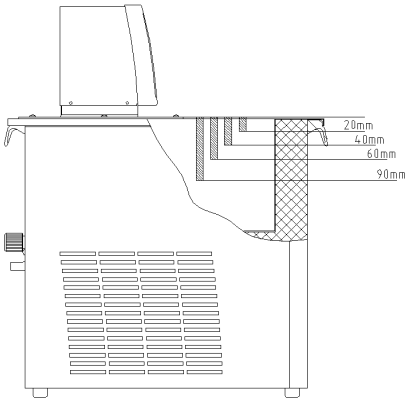
– When operating as bath thermostat without external consumer the pump connection outflow has to be closed (use closing plugs) or linked to the return.

– At bath temperature above 70 °C the label supplied must be affixed on the bath in a clearly visible position!

- The unit can be operated safely up to an ambient temperature of 40 °C.
- Depending on the loading of the refrigeration system it may switch off temporarily especially at ambient temperatures above 35 °C. Elevated ambient temperatures also result in reduced cooling capacity.
- When starting up the refrigeration system after it has been cut of operation for longer time it may take up to 30 min, depending on ambient temperature and unit type, before the nominal cooling capacity is reached.

6.2 Filling and emptying

Filling

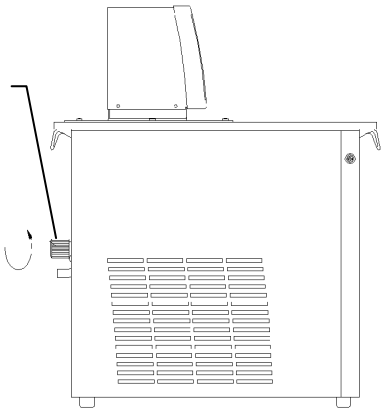


- Close the drain cock.
- Fill baths up to a maximum level of 20 mm below the bath bridge.
- Optimum operation at 20-40 mm below the bath bridge.
- Operation is possible down to 60 mm below the bath bridge.
- The low-level cut-out operates approx. 90 mm below the bath bridge!

- When using thermal oils it is necessary to allow for an expansion of approx. 10 %/ 100 °C.
- When operating with an external consumer the total expansion takes place in the bath.

Emptying

Drain cock



- Switch off the thermostat, pull out the mains plug!
- Drain the bath liquid through the drain cock → using tubing.

- The units are designed for operation with non-flammable and flammable liquids to DIN EN 61010-2-010 IEC 61010-2-010!
  Flammable liquids can be operated up to no more than 25 °C below the fire point (⇨ 6.3).
- Observe the appropriate regulation when disposing of used heat transfer liquid.
- When connecting an external consumer take care that the level of the bath liquid does not decrease too much → fill in heat carrier liquid if necessary.

Do not drain the heat transfer liquid when it is hot or very cold (below 0 °C)!

6.3 Bath liquids and hose connections

Heat transfer liquids

LAUDA Designation		Working temperature range	Chemical Designation	Viscosity (kin)	Viscosity (kin) at Temperature	Fire-point	Size Cat. No.		
	Former designation	from °C to °C		mm²/s at 20 °C	mm²/s	°C	5 l	10 l	20 l
Aqua 90 ①	water ①	5...90	decalcified water	1	--	--	LZB 120	LZB 220	LZB 320
Kryo 30 ②	G 100 ②	-30...90	Mono-ethylene-glycol/water	4	50 at -25 °C	--	LZB 109	LZB 209	LZB 309
Kryo 51	---	-50...120	Silicone oil	5	34 at -50 °C	> 160	LZB 121	LZB 221	LZB 321
Kryo 20	160 MS	-20...180	Silicone oil	11	28 at -20 °C	> 230	LZB 116	LZB 216	LZB 316
Ultra 350 ③	330 SCB ③	30...200	synthetic thermal oil	47	28 at 30 °C	> 240	LZB 107	LZB 207	LZB 307
Therm 200	RDS 50	60...200	Silicone oil	54	28 ... 60 °C	> 362	LZB 117	LZB 217	LZB 317

① At higher temperatures → Evaporation losses → Use bath covers (⇨ 9).
Distilled water or fully deionised water must only be used with the addition of 0,1 g sodium carbonate (Na_2CO_3)/ l water, otherwise → danger of corrosion!

② Water content falls after prolonged operation at higher temperatures → mixture becomes flammable (flash point 128 °C) → Check the mixture ratio with a dosimeter.

③ Do not use in conjunction with EPDM tubing!

– When selecting bath liquids it should be noted that performance must be expected to worsen at the lower limit of the operating temperature range due to increasing viscosity. The full operating range should only be utilised if really necessary.

– The operating ranges of the bath liquids and tubing represent general data which may be limited by the operating temperature range of the unit.

Silicone oil causes pronounced swelling of Silicone rubber → never uses Silicone oil with Silicone tubing!

Safety data sheets are available on request!

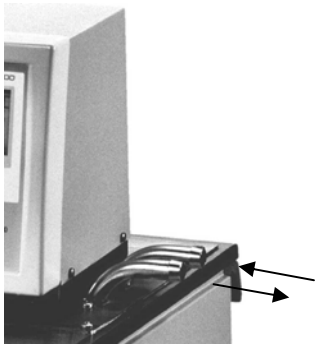
Hose connections

Tubing type	Int. dia. Ø mm	Temperature range °C	Application	Ref. No.
EPDM-tubing, non-insulated	9	10...120	for all bath liquids except for Ultra 350 and mineral oils	**RKJ 111**
EPDM-tubing, non-insulated	12	10...120	for all bath liquids except for Ultra 350 and mineral oils	**RKJ 112**
EPDM-tubing insulated	12 ext. dia. approx. 35mm	-60...120	for all bath liquids except for Ultra 350 and mineral oils	**LZS 021**
Silicone tubing, non-insulated	11	-30...100	water, water/ glycol mixture	**RKJ 059**
Silicone tubing insulated	11 ext. dia. 35mm approx .	-60...100	water, water/ glycol mixture	**LZS 007**
Viton	11	10...200	for all bath liquids	**RKJ 091**

- EPDM- EPDM-tube **not** for Ultra 350 and mineral oils!
- Silicone oil causes pronounced swelling of Silicone rubber → never uses Silicone oil with Silicone tubing!
- Protect tubing with hose clips against slipping off.

6.4 Connection of external circuits

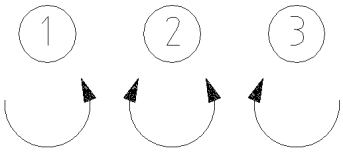
Operation as circulation thermostat

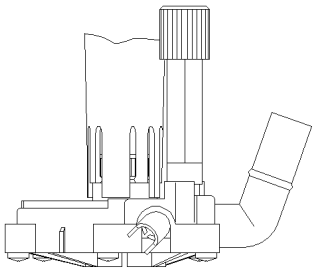


- When used as circulation thermostat, care for shortest hose connections with largest inner diameter as possible. This gives the best flow.
- Connect 11-12mm int. diameter tubing (⇨ 6.3) to the pump connector.
- Pump connections:
  – return to bath
  – Pump outflow, pressure output
  (⇨ labelling housing)

- If the cross-section of the tubing is too small → temperature drop between bath and external system due to low flow rate. Increase the bath temperature appropriately.
- Always ensure the maximum possible flow cross-section in the external circuit!

- When the external consumer is placed at a higher level than the thermostat the pump is stopped and air penetrates into the thermostating circuit the external liquid may drain down into the bath even with a closed system → danger of flooding the thermostat
- Protect tubing with hose clips against slipping off!
- When no external circuit is connected to the thermostat, the pump connection outflow must be closed (use closing plugs) or linked to the return!





- Using the setting knob at the pump outflows, divide up the pump flow in accordance to the thermostating task (⇨ 6.1)
- Position ① → maximum flow in the external circuit (setting knob turned anticlockwise).
- Position ②→ flow passes through pump outflow and outlet for bath circulation (setting knob in medium position).
- Position ③ → external circuit is closed and the outlet for bath circulation fully open (setting knob turned clockwise).

- Operate the setting knob only when the bath contents are near the ambient temperature.
- When no tubing is connected, close the pump connection with closing plugs even in position ③.

7 Starting up

7.1 Connection to the supply

Compare the supply voltage against the data on the rating label.

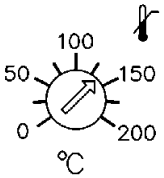
Model according to EMC requirements DIN EN 61326-1 class B (for Europe only).(⇨ 10)

- Connect the unit only to a grounded mains power socket (PE).
- No warranty when the thermostat is connected to a wrong supply!
- Please make sure that your mains plug is equipped with at least the following safety fuses.

Power supply	Fuse protection
230 V	16 A
208 V	15 A
115 V	15 A

- The start current of the refrigerating machine may exceed those currents distinctly for a short time.
- Without external circuit ensure that the pump pressure outflow is closed or linked to the pump return.
- Ensure that the unit is filled in accordance with Section 6.2!

7.2 Switching on

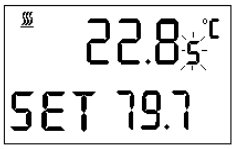


- Using a screwdriver. Set the over temperature switch-off point to a value clearly above ambient temperature.

- Switch on at the mains switch.
  The green LED for "Supply ON" lights up.

0.25 sec

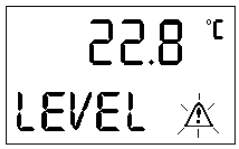
- A tone sounds for approx. 0.25 sec.
- The unit self-test starts up. All display segments and symbols light up for approx. 1 sec. Then the software version is indicated for approx. 1 sec.



- Display shows the actual bath temperature (above) (resolution 0.05°) and of the set point. The pump starts up. The values which were active before switching off are used.

- If necessary add more heat transfer liquid to replace the amount pumped out to the external circuit.
- If the pump does not purge the system immediately. The unit may switch off again although it is filled sufficiently (only when starting up for the first time).

– A double signal tone sounds.



– The display for **LEVEL** (low-level) appears.
– The fault triangle is flashing.

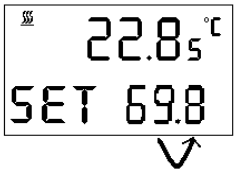
– Press the key. If necessary repeat several times.
– Also press the key if the unit had switched off under a fault condition.

7.3 Set point selection (level 0)

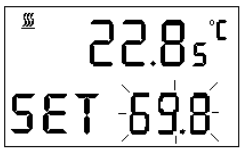
or

– Input the set point with one of the keys.
– Speeding the setting process by:

a) continuous pressing the keys **or**
b) pressing one key (holding it down) and shortly pressing the other key.



– Briefly releasing (1 sec) the key (s) and again pressing one of the keys moves the cursor **one place to the right**.



– Display flashes 4 sec → the new value is accepted automatically, **or**

– the value is entered immediately with this key.

– For safety reasons the set point can only be adjusted up to 2°C above the upper limit of the operating temperature range of the particular unit type.

7.4 Menu functions

– Switching from set point selection (level 0) to level 1 using the key.

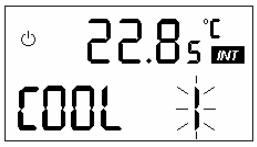
or

– Within one level it is possible to scroll using the keys.
– **In principle**, after each setting has been made it is entered automatically after approx. 4 sec **or**

– settings are entered immediately on operating this key.

7.4.1 **Refrigeration system** (level 1)

– The display shows the current bath temperature, **COOL** and the set operating mode. To alter the setting, press the key on the left.



– The display flashes (approx. 4 sec). During this time start to set the operating mode with one of the keys.

or

0 = Refrigeration system OFF
1 = Refrigeration system ON 100 % capacity
2 = Refrigeration ON. Approx. 50% capacity (only at RE 205, RE 207, RE 210, RE 212, RE 220)
A = automatic operation (⇨ 7.5).

– Forward with key to "pump output" **or**

– with key back to level 0 (set point input).

– The refrigeration system can normally work with automatic operation = A. The refrigeration system switches on or off depending on the temperature and operation status.

– In special cases the cooling machine can be switched off → ”0”, to continuous operation → “I“ or to 50 % output "2".

– The refrigerating machine cannot be added manually while running at maximum heating output, because then the maximum currents (⇨ 7.1) would be exceeded.

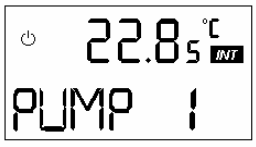
– The maximum heating output will be required for great set-point leaps.

7.4.2 **Pump output**

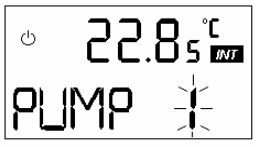
and **1x**

– For setting the pump output from level 0 press the key combination shown on the left, **or**

– move forward from **COOL** function with this key.



– The display shows the current bath temperature, **PUMP** and the current output step. To alter the setting presses the key shown on the left.



– Display flashes (approx. 4 sec).

– During this time start to set the required step with one of the keys.
0 = pump stopped, heating off
1 = low pump output
2 , 3 , 4 = medium pump output
5 = maximum pump output

– The pump responds immediately (can be heard).
(Setting is entered after approx. 4 sec).

– Move forward with key to "Selecting the set point resolution“ **or**

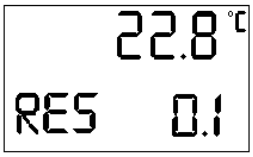
– back with the key to "Set point selection".

7.4.3 Setting the set point resolution

and **2x**

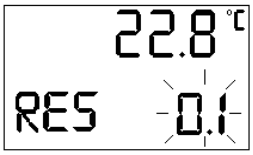
– To set the set point resolution from level 0 press the key combination on the left **or**

– move forward with the key from the **PUMP**-function.



– The current bath temperature, **RES** and the current set point resolution are indicated.

– To alter the setting, press the key on the left.



– Display flashes (approx. 4 sec).

or

– During this time, start to set the required resolution with one of the two keys.
0.1 = 0.1 °C set point resolution, normal setting
0.01 = 0.01 °C set point resolution. During set point input only **S** is indicated instead of **SET**.

– Forward with the key to "programmer level" **or**

– with key back to **PUMP**.

7.4.4 Programmer level (PGM)

The programmer function of the units permits storage of 1 temperature-time programmes. The programme consists of several temperature-time segments. In addition there is the information how many times the programme should be run (LOOP). The total number of all the segments must not exceed 20. A segment is normally a ramp which is defined by the target temperature, i. e. the temperature at the end of the segment, and the duration from the start to the end of the segment. It is possible to have temperature steps, i. e. the time is zero, and also temperature hold phases, i. e. the same temperature at the start and at the end of a segment. At the start of the programme the current actual temperature is taken as the start temperature of the first segment.

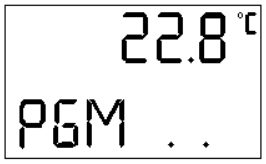
– It is recommended to adjust the set point to a defined value before the start of the programme, and to terminate the programme at the same temperature.

– The programmer can also be operated or modified via the RS 232.

and **3x**

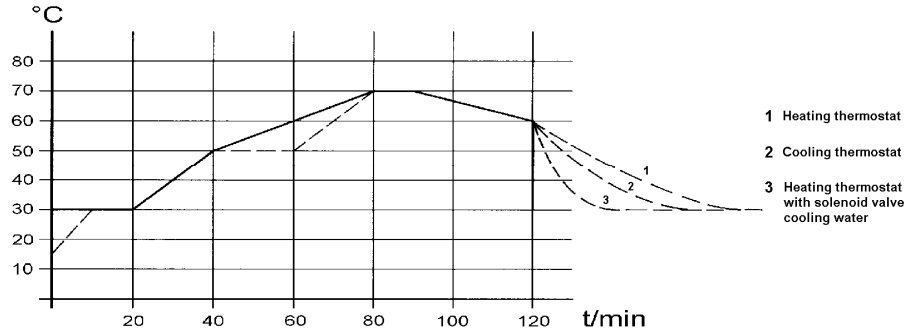
– To view or to set the programmer, starting from level 0 (set point input) press the key combination on the left, **or**

– from **RES** function scroll with this key.



– The display shows **PGM** (programmer). Data for up to 20 programme segments can be input there.

7.4.4.1 Programme example



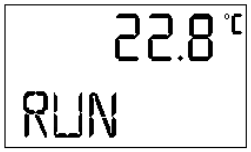
Segment	1	2	3	4	5	6	7
Temperature	30,0	50,0	70,0	70,0	60,0	30,0	
Time	20	20	40	10	30	0	

Segment	1	2	3	4	5	6	7
Temperature	30,0	50,0	50 ①	70,0	70,0	60,0	30,0
Time	20	20	20 ①	20 ②	10	30	0

① A new segment has been inserted after segment No. 2 (⇨ 7.4.4.5)
② The time at segment No. 3 has been altered (⇨ 7.4.4.2)

7.4.4.2 Indicating/ altering of programme segments

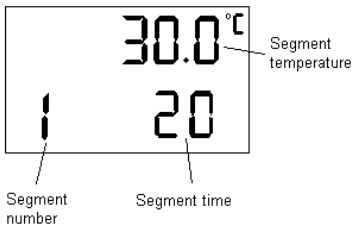
– When **PGM** appears on the display (therefore proceed as described in 7.4.4) press the key on the left.



– The display shows **RUN**. Here the programmer can be started (⇨ 7.4.4.4).

– Forward with key until **EDIT** appears.

– Here the programme segments can e.g. be indicated and altered.
To do so press the key shown on the left.

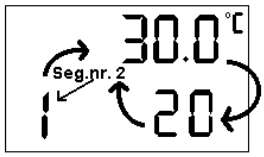


– The display indicates 3 variables: segment number (a), segment end temperature (b) and segment time (c).
Example: segment number 1, b = 30.0 °C, c = 20 min. The heat transfer liquid has to be heated up or cooled down to 30 °C within 20 min.

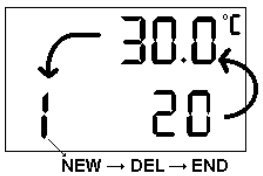
– When having deleted the programme example the variables on the display show 0. Before altering the segments it is necessary to insert new segments (⇨ 7.4.4.4).

or

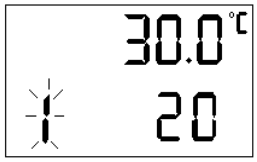
– These keys can be used to scroll through the different variables.



– Sequence with the key: 1 (a) → 30.0 °C (b) → 20 (c) → 50.0 °C (2. Segment), → 20 (2. Segment).



– When the segment number is flashing, pressing the key leads directly to the menu for inserting or deleting segments (⇨ 7.4.4.5).
Otherwise scroll e.g. from segment time back to segment temperature and segment number.



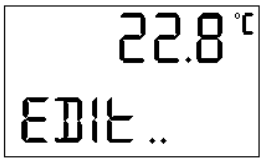
– The variable currently activated flashes quickly (here the segment number).

– To alter the required variable starts with this key.

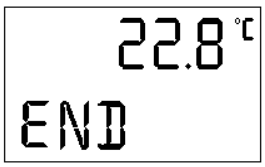
or

- If e.g. the segment number is flashing, all segments can be indicated in sequence by pressing one of the two keys, **or**
- if segment temperature or segment time are flashing, the required temperature or time can be input by pressing the key and then using the other two keys.
- Segment temperature: 2 °C max. above the upper limit of the operating temperature range of the particular thermostat type.
- Segment time: 0...255 min.

- After having changed the segments move forward with key to **END**.



1. Forward with the key to **EDIT**.



- with the key to **END** and **then**

- back to level 0 with the key, **or**

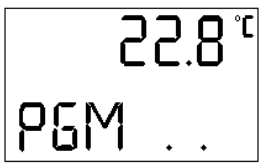
2. with the key back to **LOOP** (⇨ 7.4.4.3) resp. to **RUN** (⇨ 7.4.4.4).

- While the programmer is in operation segments can be altered (including the current segment) and new segments can be inserted. All segments can also be deleted at each time, except the current segment (⇨ 7.4.4.5).

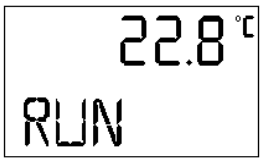
BUT: If the new segment time is shorter than the segment time which has already elapsed, the next segment is activated.

If a segment time longer than 255 min is required, this time must be distributed over several consecutive segments.

7.4.4.3 Number of programme running



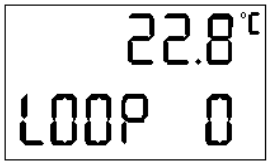
- From level 0 proceed as described under 7.4.4. When **PGM** appears on the display, press the key on the left.



– The display first shows **RUN**.

– Forward with key until **LOOP** appears, **or**

– from **EDIT** with this key **LOOP**.



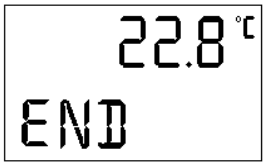
– Here the number of programme running can be input. Therefore press the key. The display is flashing for approx. 4 sec.

or

– During this time start to set the required number of running with one of the two keys.
Input possibility: 0...255 (0 = infinite).

– Then with the key back to **RUN** (⇨ 7.4.4.4) **or**

– with key until **END** and **then**

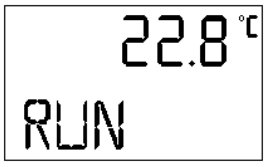


– with key back to "set point selection" (level 0).

7.4.4.4 Starting of the programmer

– From level 0 proceed as described under 7.4.4. When **PGM** appears on the display, press the key on the left.

– The display shows **RUN or**

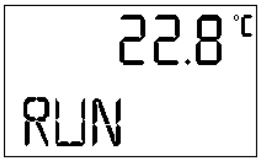


– start the programme with the key on the left. The set point level (level 0) is then on display.

- During the start the current set point is accepted as the starting value.
- If the programmer is activated:
  level 0 shows **PGM** XXX.XX instead of **SET** XXX.XX (set point temperature), with PGM flashing short **(short off, long on)**.
- Set point can not be input with 0.01 °C resolution (only possible via RS 232 interface).
- **GENERAL RULE:** Programmer can also be loaded and operated via the RS 232 interface.

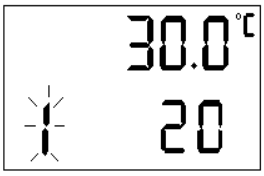
7.4.4.5 Inserting/ deleting of program segments

1. From level 0 proceed as described under 7.4.4. When **PGM** appears on the display, press the key on the left.



2. The display shows **RUN** (or **STOP** if the programmer had been started). Scroll with this key until **EDIT** appears.

3. The display shows **EDIT**, press the key.

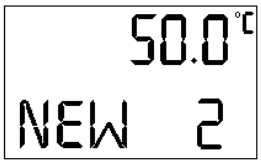


4. Segment number is flashing, press the key.

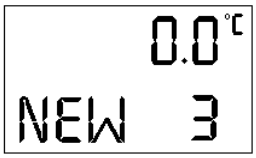
or

- Using the keys, select the segment number **behind** which the new segment has to be inserted.
  Example: (⇨ 7.4.4.1). A new segment has to be inserted after segment 2. Select segment 2 with the keys.

- Enter the value, or it is entered automatically after 4 sec.



- With the key forward until **NEW** appears. The segment number “2” behind which the new segment and the segment temperature are indicated.



– Press the key, the display shows **NEW** as well as the segment number and temperature of the new segment.

– Then jump with the key to segment temperature or segment time and start input with the key, **then**

or

– using both keys input the required segment time and segment temperature, then continue as described below (step 5-8).

– When a new segment is inserted, all subsequent segments are shifted on by one position (Example ⇨ 7.4.4.1).

– When 20 segments are inserted, the last one will disappear when a new segment will be input.

– New segments can also be inserted while the programmer is activated.

or

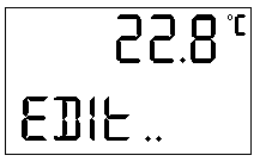
– In order to delete a segment, proceed as above step 1-4.

– Using the keys, select the segment number which has to be deleted.

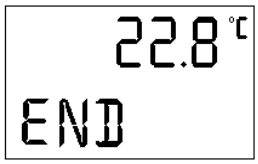
– Scroll forward with the key until **DEL** appears. Next to it the segment number to be deleted is shown.

– Press the key, the segment is deleted.

5. Then with the key forward to **END**.



6. with the key to **EDIT**, **then**



7. with the key to **END and**

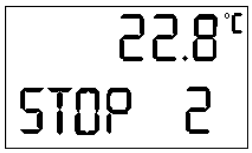
8. with the key back to level 0.

- When a segment is deleted, all subsequent segments move forward by one position.
- When the programmer is activated, the currently active segment cannot be deleted.
- **To input a segment time longer than 255 min it has to be split between several consecutive segments.**

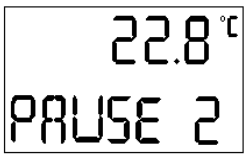
7.4.4.6 Holding/ continuing the programme

- When the programmer is activated, the programme can at any time be held and be continued again.
  For this

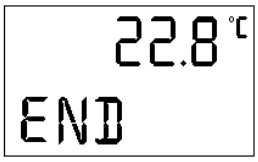
1. from level 0 proceed as described under 7.4.4. When the display shows **PGM**, press the key.



2. The display shows **STOP**. Scroll forward with the key until **PAUSE** appears.

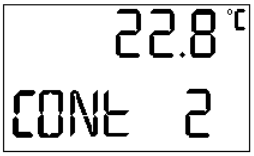


- The currently running segment is shown after press the key.



- The programme is held. Scroll forward to **END**, then press the key to return to level 0.

- When the programme is held with **PAUSE** the display at level 0 no longer shows **SET** XXX.XX (set temperature) but **PGM** XXX.XX, with **PGM not** flashing.



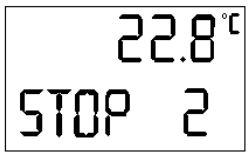
- To continue the programme, proceed as described in steps 1-2 above, but scroll forward until the display shows **CONt**. The segment number of the programmer during which the programme was held, is shown after **CONt**.

- Press the key, the programme continues, the programmer jumps back to level 0.

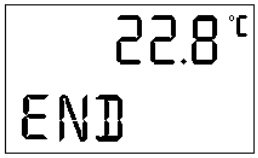
- When the programme is continued, the display **PGM** XXX.XX at level 0 is again flashing.
- If there is a fault, the programme is stopped by **PAUSE**. After the fault has rectified, the system has to be reset with **CONt**.

7.4.4.7 Terminating the programme

– From level 0 proceed as described under 7.4.4. When the display shows **PGM**, press the key.



– The display shows **STOP**. The current segment is indicated after **STOP**. Press the key, the programme is terminated immediately.



– With the key, forward to **END**, **then**

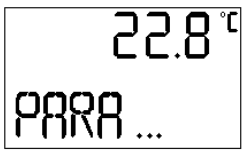
– with the key back to level 0.

7.4.5 Parameters

and **4x**

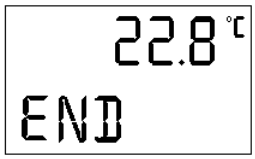
– Directly from level 0 (set point selection) press the key combination on the left.

– Forward with the key from **PGM**-function.



– Here it is possible to switch over to level 2. Press the key on the left, continue with section 7.4.4.2 **or**

– with key to step **END**.



– End of the menu.

– Return to level 0 (set point selection) with the key on the left.

7.4.5.1 Setting the proportional band of the PID-controller

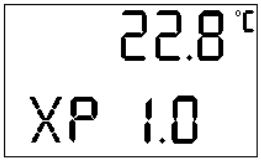
and **4x**

– Directly from level 0 (set point selection), press the key combination on the left, until the PARA function is reached, **then**

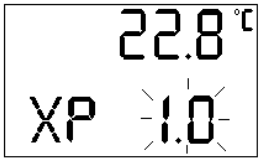
– switch to level 2 from **PARA** (see above) with key on the left.

or

– Within this level it is possible to scroll with the keys.



– The display shows the current bath temperature Xp and the current setting. To alter the setting presses the key on the left. Available settings from 0.5 to 9.9 °C.
(⇨ 7.4.5.2 ☞ Note)
(⇨ 9 Technical data)

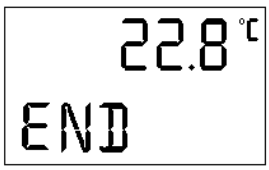


– Display flashes (approx. ca. 4 sec).

or

– During this time start to set the required value with one of the two keys.

– Forward with the key to "Setting the reset time" **or**



– with the key back to "**PARA**".

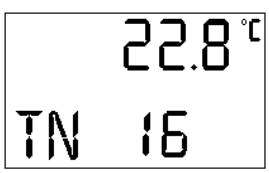
7.4.5.2 Setting the reset time of the PID-controller

and **4x**

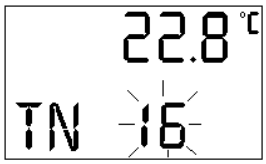
– Directly from level 0 (set point selection), press the key combination on the left, until the **PARA** function is reached, **then**

and **1x**

– switch to level 2 and move forward with the keys on the left.



– The display shows the current bath temperature, **Tn** and the current setting. To alter the setting, press the key on the left. → Possible adjustment from 5 to 60 sec.



– The display is flashing (approx. 4 sec).

or

– During this time, start to set the required value with one of the two keys.

– Forward with the key to "Selection of the interface" **or**

– with key back to "Setting the proportional band".

☞ – The control parameters are pre-set to suit the unit type.
Normally no change is required. Some adjustment is necessary only when using Silicone oil and with very stringent demands on short-term stability. If there are control fluctuations, increase the values for Xp and Tn. If the set point is not reached → select smaller values. The derivative time Tv (D-part) is altered automatically through a fixed factor to Tn.
(Standard settings of control parameters and pump ⇨ 10)

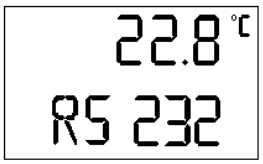
7.4.5.3 Selection of the interface

and **4x**

– Directly from level 0 (set point selection), press the key combination on the left, until the **PARA** function is reached, **then**

and **2x**

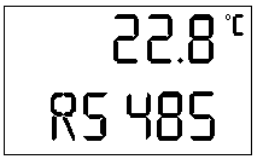
– switch to level 2 and move forward with key on the left.



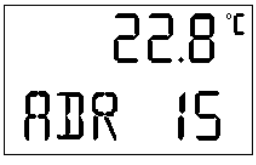
– The display shows the current bath temperature and the currently set interface. To alter the setting presses the key.

or

– Display flashes (approx. 4 sec.). During this time start to set the required interface.



– Having chosen the **RS 485** interface press the key.



– The display shows the current bath temperature, **ADR** and the current unit address (e.g. 15).
Press the key, display flashes (approx. 4 sec.)

or

– During this time start to set the required unit address. (Possible setting: 000...127).

– Forward with key to ”Setting the baud rate” **or**

– back with key to ”Selection of the interface” resp. when pressing the key twice you return to ”Setting the reset time”.

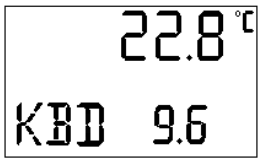
7.4.5.4 Setting the Baud rate/ transfer rate (serial interface)

and **4x**

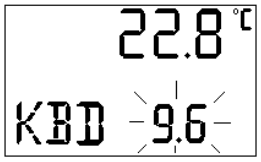
– Directly from level 0 (set point selection), press the key combination on the left, until the **PARA** function is reached, **then**

and **3x**

– switch to level 2 and move forward with key on the left.



– The display shows the current bath temperature, **KBD** and the current setting. To alter the setting presses the key.



– Display flashes (approx. 4 sec).

or

– During this time, start to set the required value with one of the two keys.
Settings available: 2400, 4800, 9600 or 19200 baud.

– Forward with key to “user calibration" **or**

– With key back to "Selection of interface".

7.4.5.5 User calibration

– Remove the external consumers and switch the setting knob of the pump to right side (⇨ 6.4).

– A reference thermometer with necessary accuracy is required. Otherwise the factory calibration should not be altered. The reference thermometer has to be inserted far enough and long enough into the bath.

– It is not allowed to calibrate to more than ± 3 °C. Multiple calibrations to more than ± 3 °C cause internal faults (after 2 min **“E1006”** or **“E16”**).

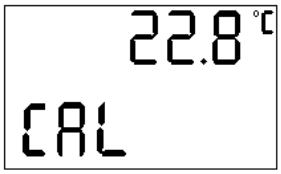
– **The factory calibration will be lost through overwriting → please work carefully!!!**

and **4x**

– Directly from level 0 (set point selection), press the key combination on the left, until the **PARA**-function is reached, **then**

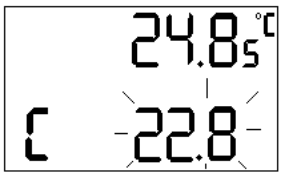
and **4x**

– switch to level 2 and move forward with key on the left.



>2,5 sec

1. The display shows **CAL** and the current bath temperature. To carry out a calibration, press the key longer than 2.5 sec.

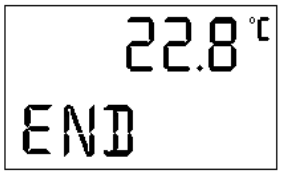


2. The actual value appears.

or

3. Input the value indicated on the reference thermometer with one to the two keys.

4. The additive calibration **must be** entered with the key shown on the left.



5. Forward with key to **END**, **then**

6. Switch back to level 0 **or**

7. with key back to "Setting the transfer rate".

Example:

a) Insert a suitable thermometer into the bath (long enough and far enough).

b) Remove the external consumers and turn the setting knob of the pump outflows to the right side.

c) Set the set point to a temperature where you use to work (e.g. set the set point to 45 °C ⇨ 7.3).

d) Wait until the actual bath temperature has reached the set point temperature of 45 °C and until the indication on the reference thermometer does not change any more.

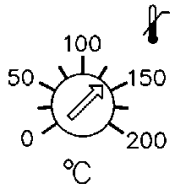
e) The reference thermometer shows e.g. 44.8 °C.

f) Select **CAL** on the display and go forward as mentioned under point 1-7. The actual bath temperature switches from 45 °C to 44.8 °C and the unit starts to heat up until the actual bath temperature has reached 45 °C. (→ The reference thermometer should also indicate 45 °C).

7.5 Warning and safety functions

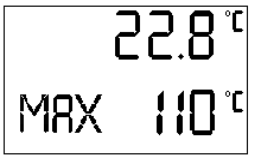
7.5.1 Overtemperature protection and testing

- The units are designed for operation with non-flammable and flammable liquids to DIN EN 61010-2-010 IEC 61010-2-010.



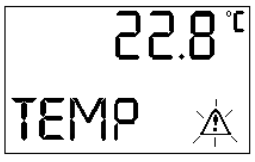
- Set the overtemperature switch-off point. Recommended setting 5 °C above required bath temperature.

- Not higher than 25 °C below the fire point of the bath liquid (⇨ 6.3).



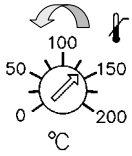
- The actual switch-off point is indicated on the display, e.g. **MAX 110 °C**.

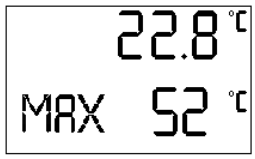
- When the switch-off point is being adjusted by more than 2 °C → display shows **MAX** and actual overtemperature switch-off point with 1 °C resolution for approx. 4 sec.
- The position of the potentiometer is decisive for the setting. The display is just a help for the setting.
- Setting is possible only up to an upper limit of the operating temperature range + 5 °C.



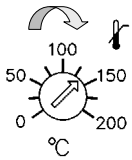
- When the bath temperature arises above the overtemperature switch-off point:
  1. Double signal tone sounds.
  2. The display shows the indication for overtemperature (**TEMP**) the fault triangle is flashing
     → heating is switched off on both poles,
     → pump and refrigeration system are switched off by the electronics
- Rectify the cause of the fault.
- Wait until the bath temperature has cooled down below the switch-off point or set the switch-off point at a higher value.
- When the display shows **TEMP**, reset with the key.

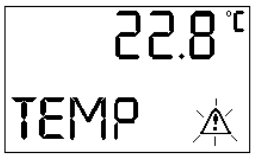
- Before the unit is running unattended for longer periods **overtemperature protection** should be tested. **Therefore**





– Turn the potentiometer slowly anticlockwise. → The unit must switch off at the bath temperature.





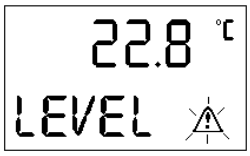
– Step 1 - 2 (see above) must follow.

– Set the overtemperature switch-off point again above the bath temperature and wait until the indication **TEMP** appears on the display, **then**

– reset with the key.

7.5.2 Low-level protection and testing

– Double signal tone sounds, if the bath liquid falls so much that the heater is no longer covered with liquid completely.



1. The display shows **LEVEL** (low-level) and the fault triangle is flashing
   → heating is switched off on both poles,
   → pump and refrigeration system are switched off by the electronics.

2. Top up the bath (⇨ Section 6.2), wait until **LEVEL** appears and reset with the key.

– If necessary repeat several times in case that the pump does not purge immediately.

– **Testing at regular intervals** by lowering the bath level. Place a hose on the pump connector and pump some of the bath liquid into a suitable container.

– Step 1 - 2 must follow.

– Bath temperature during this test not below 0°C or higher than 50°C, otherwise danger of burn injuries!

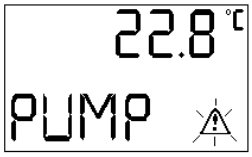
– If there is any irregularity when testing the safety devices, switch off the unit immediately and pull out the mains plug!

– Have the unit checked by the **LAUDA service** or the local service organisation!

7.5.3 Pump motor monitoring

– In case of pump motor overload or a blockage the heating and the pump are switched off.

– Double signal tone sounds.

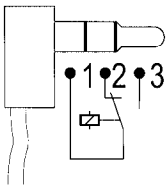


– The display shows **PUMP** and the fault triangle is flashing.
– Rectify the cause of the fault, e.g. clean the pump or check the viscosity, **then**

– reset with the key.
– If several faults appear simultaneously, they have to be reset individually.

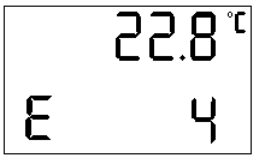
7.5.4 Connection floating contact “Combination fault” 31 N

(Alarm out) 3-pole locking connector
1 = common, 2 = o.k. (break), 3 = n.o. (make). When the unit is o.k. 1 and 3 are closed (see ill.). Max contact rating: 0.2 A 24 V. 3-pin plug (⇨ 9).



– Contact operates in case of error at overtemperature protection, low-level protection, pump monitoring or any other error message.

7.5.5 Other error messages



– **E 4** etc. is flashing in the bottom line.

– In case of error messages please contact the LAUDA Service Centre (or the service department of your LAUDA agent ⇨ 8.4).

– If the fault report is repeated → pull out the mains plug and try whether the motor can be rotated by the fan blade inserting a screwdriver into the ventilation opening at the back of the unit.
– Error code 0...255 → microprocessor error.
– Error code 1000...1255 → slave processor error.
– Indication can be used for remote diagnosis.

– After rectifying the fault, reset with the key.

7.6 Serial Interfaces RS 232, RS 485

7.6.1 RS 232 Interface

Connecting cable and interface test:

Computer					Thermostat		
Data	9-pin sub-D socket		25-pin sub-D socket		9-pin sub-D socket		Data
	①	②	①	②	①	②	
R x D	2	2	3	3	2	2	T x D
T x D	3	3	2	2	3	3	R x D
DTR	4		20		4		DSR
Signal Ground	5	5	7	7	5	5	Signal Ground
DSR	6		6		6		DTR
RTS	7		4		7	┌ 7	CTS
CTS	8		5		8	└ 8	RTS

① with Hardware Handshake: When connecting the thermostat to the computer please use a 1:1 cable and **not** a zero-modem-cable!

② without Hardware Handshake: The computer needs an operating mode: “without hardware handshake”. In the plug of the thermostat a bridge has to be inserted between Pin 7 and 8.

- Use screened connecting cables.
- Connect the screen to the plug case.
- The connections are galvanically isolated from the rest of the electronics.
- Unoccupied pins must not be connected!

The RS 232 Interface can easily be tested with the PC connected, using the MS-Windows operating system. On Windows 3.11 with the programme "Terminal" and on Windows® 95/ 98/ NT/ XP with the programme "Hyper Terminal”.

Protocol:

- The interface operates with 1 stop bit, no parity bit and 8 data bits.
- Transfer rate either 2400, 4800, 9600 (factory setting) or 19200 baud as selected.
- The RS 232 interface can be operated with or without hardware handshake (RTS/ CTS).
- The command from the computer must be terminated with CR, CRLF or LFCR.
- The response of the thermostat is always terminated with CRLF.

CR = carriage return (hex: 0D)
LF = line feed (hex: 0A)

Example: Transfer of set point 30.5 °C to the thermostat.

Computer	Thermostat
„OUT_SP_00_30.5“CRLF	⇨
⇦	„OK“CRLF

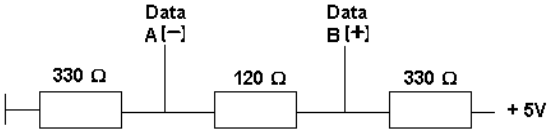
7.6.2 RS 485 Interface

Connecting cable:

Thermostat	
9-pin sub-D-socket	
Contact	Data
1	Data A (-)
5	SG (Signal Ground) optional
6	Data B (+)

- Use screened connecting cables.
- Connect the screen to the plug case.
- The connections are galvanically isolated from the rest of the electronics.
- Unoccupied pins must not be connected!

The **RS 485** bus absolutely needs a bus-termination in form of a terminating network, which ensures a defined unattended time in the high resistance phases. The bus-terminal is defined as follows.



Generally this network is integrated on the plug in card of the computer (RS 485).

Protocol:

- The interface operates with 1 stop bit, no parity bit and 8 data bits.
- Transfer rate either 2400, 4800, 9600 (factory setting) or 19200 baud as selected.
- The RS 485 commands are always preceded by the device address. There is provision for 127 addresses. The address must always have 3 digits. (A000_... to A127_...).
- The command from the computer must be terminated with CR.
- The response of the thermostat is always terminated with CR.

CR = carriage return (hex: 0D)

Example: Transfer of set point 30.5 °C to the thermostat with address 15.

Computer	Thermostat
„A015_OUT_SP_00_30.5“CR	⇨
⇦	„A015_OK“CR

7.6.3 Write commands (data commands to the thermostat)

Command	Explanation
OUT_SP_00_XXX.XX	Set point transfer with up to 3 places before the decimal point and up to 2 places behind
OUT_SP_01_XXX	Pump output step 1, 2, 3, 4, or 5; 0 = Stop (Standby)
OUT_SP_02_XXX	Refrigerator 0 = OFF / 1 = ON 100% / 2 = 50% (reduced capacity RE 205, 207, 210, 212, 220) / 3 = automatic operation
OUT_PAR_00_XXX.XX	Setting of control parameter Xp for controller (0.5 to 9.9°C)
OUT_PAR_01_XXX	Setting of control parameter Tn (5 to 60 sec)
OUT_MODE_00_X	Keys: 0 = free / 1 = inhibited
START	Switches thermostat on (from standby).
STOP	Switches thermostat to standby (pump, heating, refrigerator off).

- For "_" use also " " (blank character).
- Response from thermostat "OK" or in case of error "ERR_X" (RS485 interface e.g. "A015_OK" or in case of error "A015_ERR_X").

Permitted data formats:

-XXX.XX	-XXX.X	-XXX.	-XXX	XXX.XX	XXX.X	XXX.	XXX
-XX.XX	-XX.X	-XX.	-XX	XX.XX	XX.X	XX.	XX
-X.XX	-X.X	-X.	-X	X.XX	X.X	X.	X
-.XX	-.X	.XX	.X				

7.6.4 Read commands (data requested from the thermostat)

Command	Explanation
IN_PV_00	Read bath temperature (outflow temperature)
IN_SP_00	Read temperature set point
IN_SP_01	Read pump output step
IN_SP_02	Read operating mode of refrigerator 0 = OFF / 1 = ON 100% / 2 = ON 50% (reduced capacity RE 205, 207, 210, 212, 220) / 3 = automatic operation
IN_SP_03	Read current overtemperature switch-off point
IN_PAR_00	Read current value of Xp
IN_PAR_01	Read current value of Tn
IN_MODE_00	Keys: 0 = free / 1 = inhibited
TYPE	Read thermostat type
VERSION	Read software version number
STATUS	Read thermostat status 0 = OK, -1 = error
STAT	Read error diagnosis response: XXXXX → X = 0 no error, X = 1 error Char. 1 = overtemperature Char. 2 = low level Char. 3 = pump blocked Char. 4 = internal fault microcontroller 1 Char. 5 = internal fault microcontroller 2

- For "_" use also " " (blank character).
- The thermostat response is always in the fixed decimal format "XXX.XX" or for negative values "-XXX.XX" or "ERR_X". (RS 485 interface e.g. "A015_XXX.XX" or "A015_-XXX.XX" or "A015_ERR_X").

7.6.5 Error messages

Message	Explanation
ERR_2	Wrong input (e.g. buffer overflow)
ERR_3	Wrong command
ERR_5	Syntax error in value
ERR_6	Illegal value
ERR_28	receive – frame – error (e.g. stop bit missing)
ERR_29	Function blocked (at this time)→ wait a few ms, then try again
ERR_30	Programmer, all segments occupied

7.6.6 Driver software for LABVIEW®

An individual, easy-to-use control and automation software for operating the ECOLINE, INTEGRAL T, Integral XT and WK/WKL units can be programmed with the aid of the National Instruments programme development tool LABVIEW® (http://sine.ni.com/apps/we/nioc.vp?cid=1381&lang=US) In order to make programme operation possible on the RS 232/ RS 485 interface, LAUDA provides drivers specially designed for LABVIEW® which can be downloaded free of charge under http://www.lauda.de/.

8 Maintenance

8.1 Cleaning

Before cleaning the unit, pull out the mains plug!

The unit can be cleaned with water adding a few drops of detergent (washing up liquid), using a moist cloth.

Water must not enter the control unit!

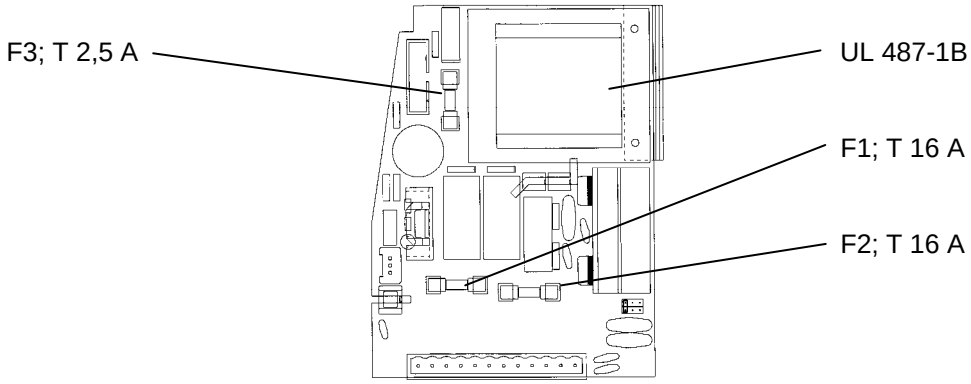
- Carry out appropriate detoxification if dangerous material has been spilled on or inside the unit.
- Method of cleaning and detoxification are decided by the special knowledge of the user. In case of doubt please contact the manufacturer.

8.2 Maintenance and repair

- Before any maintenance and repair work pull out the mains plug!
- Repairs on the control unit must only be carried out by properly qualified personnel!

LAUDA thermostats are largely maintenance-free.

- If a fuse blows (→ supply indication not alight) fit only fuses as specified (2 x T 16 A; 1 x T 2.5 A, size 5 x 20 → fuses are inside the unit).



8.2.1 Testing the heat transfer liquid

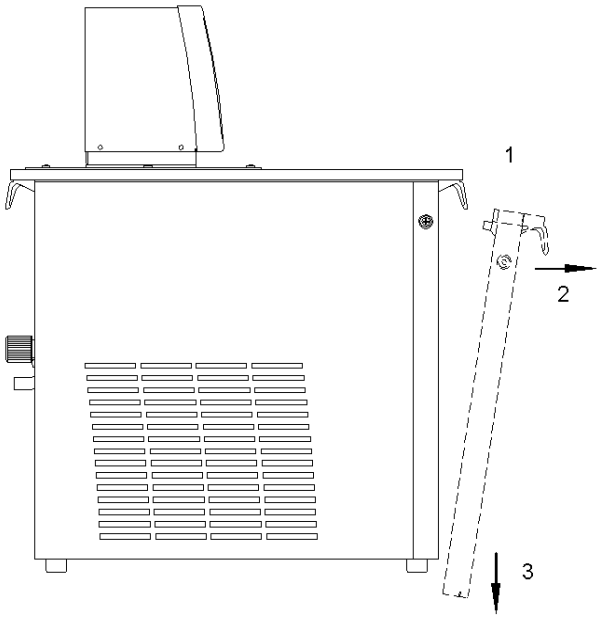
If the heat carrier liquid becomes contaminated, it has to be replaced (⇨ 6.2).

If required, the heat carrier should be checked for fitness for use (e.g. when changing the method of operation), or at least half-yearly. Further use of the heat carrier is only permissible if the inspection indicates this.

The test of the heat carrier liquid should takes place according to DIN 51529; Testing and assessment of used heat carrier media.
Source: VDI 3033; DIN 51529.

8.2.2 Maintenance of the refrigeration unit

The refrigeration unit operates largely without maintenance. Depending on the ambient dust conditions and the operating time, any dust on the heat exchanger (condenser) must be removed at intervals on 2 weeks or longer. This is done after taking off the front grille. Brush off the condenser and if necessary blow through with compressed air.



8.3 Disposal information

8.3.1 Disposal of the refrigerant

The refrigeration circuit is filled with CFC-free HFC refrigerant. The type and filling quantity can be read on the unit or on the rating plate. Repair and disposal only through a qualified refrigeration engineer!

Global Warming Potentials GWP [CO2 = 1,0]			
Refrigerant	$GWP_{(100a)}$*	Refrigerant	$GWP_{(100a)}$*
R-23 / HFC-23	12 000	R-404A / HFC-404A	3784
R-134a / HFC-134a	1 300	R-508A / HFC-508A	11 939

* Time span 100 years – according to IPCC II (1996) → Basis for Kyoto Protocol

8.3.2 Disposal of the packaging

Packaging part	Material	Type of disposal
Pallet	– laminated wood – wood, for export (Douglas)	Reusable Pallet recycling
Inner and/ or outer packaging	Corrugated card board	Paper recycling
Foam inner packaging	Polyurethane foam (PUR) and bags polyethylene foil (PE)	Plastics recycling
Cushion-damper parts (Technoschaum)	Polyethylene (PE) Foam plastic slabs	Plastics recycling
Bubble wrap	Polyethylene foil (PE)	Plastics recycling
Airbags (Volume filler)	Air filled polyethylene bags (PE)	Plastics recycling
Molded parts	Polystyrene, foam (EPS, Styropor®)	Plastics recycling
User manual bags	Polypropylene foil (PP)	Plastics recycling
Fastening tape	Polyester tape, high strength	Plastics recycling

If recycling is not possible, the packaging parts can also be disposed of with the normal refuse.

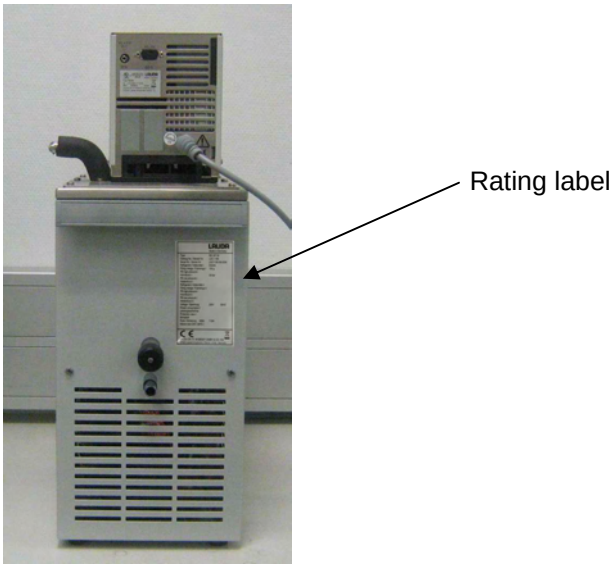
8.3.3 Note on repair

If you need to send in a unit for repair, it is essential to first contact the LAUDA Service Centre (⇨ 8.4).

– If the equipment has to be returned to the factory, please ensure that it is carefully and properly packed. LAUDA accepts no responsibility for damage due to unsatisfactory packing.

8.4 Ordering spares

When ordering spares please quote instrument type and serial number from the rating label. This avoids queries and supply of incorrect items.



The serial number is combined like following, for example **LCK0862-09-0001**

LCK0862 = Article order number/ Ref. No.
09 = manufacturing year 2009
0001 = continuous numbering

Your contact for service an support:

LAUDA Service Constant Temperature Equipment
Telephone: +49 9343/ 503-236 (English and German)
Fax: +49 9343/ 503-283
E-mail service@lauda.de

We are available any time for your queries, suggestions and criticism!

LAUDA DR. R. WOBSER GMBH & CO. KG
Post office box 1251
97912 Lauda-Koenigshofen
Germany
Phone: +49 9343/ 503-0
Fax: +49 9343/ 503-222
E-mail info@lauda.de
Internet http://www.lauda.de/

9 Accessories

Accessories	suitable for	Ref. No.
Bath cover two parts	RE 220	LCZ 0633
Gable cover	RE 220	LCZ 011
Rising platform 8 steps	RE 206, RE 207	LCZ 0646
Rising platform 8 steps	RE 210, RE 212	LCZ 0647
Rising platform 8 steps	RE 220	LCZ 0635
3-pole locking connector (floating contact “Combination fault” 31 N)	for all units	EQS 054
Wintherm Software under Windows	for all units	LDSM 2002

For further accessories please contact us (⇨ 8.4).

10 Technical data

The figures have been determined according to DIN 12876.

				RE 204	RE 205
Operating temperature range			°C	- 10...200	-40...200
Ambient temperature range			°C	5...40 (⇨ 6.1)	
Setting resolution			°C	0.1 / 0.01	
Indication resolution			°C	0.05	
Indication accuracy				± 0.2 °C ③, additive re-calibration	
Temperature stability			±K	0.02	
Safety features ①				III/ FL	
Additional functions				2-line LCD-display	
				automatic compressor control	automatic compressor control + cooling adjustments
Heater power	230 V; 50/ 60 Hz 115 V; 60 Hz 100 V; 50/60 Hz		kW	2.25 1.3 1.0	
Cooling capacity (eff.) @ with ethanol at 20 °C ambient temperature		20 °C 0 °C –10 °C –20 °C –30 °C –40 °C	kW	0.18 0.12 0.05 --- --- ---	0.50 0.42 0.36 0.27 0.14 0.04
Pump type				pressure pump with choice of 5 output steps	
Max. discharge pressure ②			bar	0.4	
Max. flow rate ②			L/min	17	
Pump connections			mm	nipples 13 mm diameter	
Maximal bath volume			L	3...4.5	7...9.5
Bath opening (W x D)			mm	130 x 105	200 x 200
Bath depth			mm	160	40
Usable depth			mm	140	20
Height to edge of bath			mm	363	441
Overall size (W x D x H)			mm	180 x 320 x 524	280 x 400 x 602
Weight			kg	19	30
Power consumption	230 V; 50/ 60 Hz 230 V; 50 Hz 115 V; 60 Hz 100 V; 50/60 Hz		kW	2.3 --- 1.4 1.1	--- 2.3 1.4 1.3
Protection class				Protection class I according to DIN EN 61140; VDE 0140-1	
Class to EMC Standard DIN EN 61326-1 for Europe				Class B (⇨ 1.1)	
for Canada and the USA				Class A	
EC Directives				The units are conformable to directives of the European Parliament and of the council: 2004/108/EC electromagnetic compatibility and 2006/95/EC electrical equipment designed for use within certain voltage limits. The units carry the CE mark.	

① FL suitable for flammable and non-flammable liquids

② at pump output step 5

③ ⇨ 1.2 last item

We reserve the right to make technical alterations!

			RE 206	RE 207	RE 210	RE 212	RE 220
Operating temperature range		°C	- 20...200	- 35...200	- 40...200	- 30...200	- 30...200
Ambient temperature range		°C	5...40 (⇨ 6.1)				
Setting resolution		°C	0.1 / 0.01				
Indication resolution		°C	0.05				
Indication accuracy			± 0.2 °C ③, additive re-calibration				
Temperature stability		±K	0.01	0.02	0.02	0.02	0.02
Safety features ①			III/ FL				
Additional functions			2-line LCD-display				
			automatic compressor control	automatic compressor control + cooling adjustments			
Heater power	230 V; 50/ 60 Hz 115 V; 60 Hz 100 V; 50/60 Hz	kW	2.25 1.30 1.00				
Cooling capacity (eff.) @ with ethanol at 20 °C ambient temperature	20 °C 0 °C -10 °C -20 °C -30 °C -40 °C	kW	0.20 0.15 0.10 0.05 ---- ----	0.30 0.22 0.15 0.10 0.06 ----	0.50 0.42 0.36 0.27 0.14 0.04	0.30 0.23 0.19 0.13 0.04 ----	0.35 0.25 0.18 0.10 0.04 ----
Pump type			pressure pump with choice of 5 output steps				
Max. discharge pressure ②		bar	0.4				
Max. flow rate ②		L/min	17				
Pump connections		mm	nipples Ø 13 mm				
Maximal bath volume		L	4...6	4...6	7...9.5	9...12	14...20
Bath opening (W x D)		mm	150 x 130	150 x 130	200 x 200	200 x 200	300 x 350
Bath depth		mm	160	160	160	200	160
Usable depth		mm	140	140	140	180	140
Height to edge of bath		mm	396	396	441	441	441
Overall size (W x D x H)		mm	200x400x557	200x400x557	280x400x602	250x400x602	350x530x602
Weight		kg	24	25	30	28	41.5
Power consumption	230 V; 50/ 60 Hz 230 V; 50 Hz 115 V; 60 Hz 100 V; 50/60 Hz	kW	2.3 --- 1.4 1.1	--- 2.3 1.4 1.1	--- 2.3 1.4 1.3	--- 2.3 1.4 1.1	--- 2.3 1.4 1.2
Protection class			Protection class I according to DIN EN 61140; VDE 0140-1				
Class to EMC Standard DIN EN 61326-1 for Europe			Class B (⇨ 1.1)				
for Canada and the USA			Class A				
EC Directives			The units are conformable to directives of the European Parliament and of the council: 2004/108/EC electromagnetic compatibility and 2006/95/EC electrical equipment designed for use within certain voltage limits. The units carry the CE mark.				

① FL suitable for flammable and non-flammable liquids

② at pump output step 5

③ ⇨ 1.2 last item

We reserve the right to make technical alterations!

Power supply		Catalogue number	
		RE 204	RE 205
230 V ±10 %; 50/ 60 Hz		LCK 0862	---
230 V ±10 %; 50 Hz		---	LCK 1901
115 V ±10 %; 60 Hz		LCK 4862	---
100 V ±10 %; 50/60 Hz		LCK 6862	---

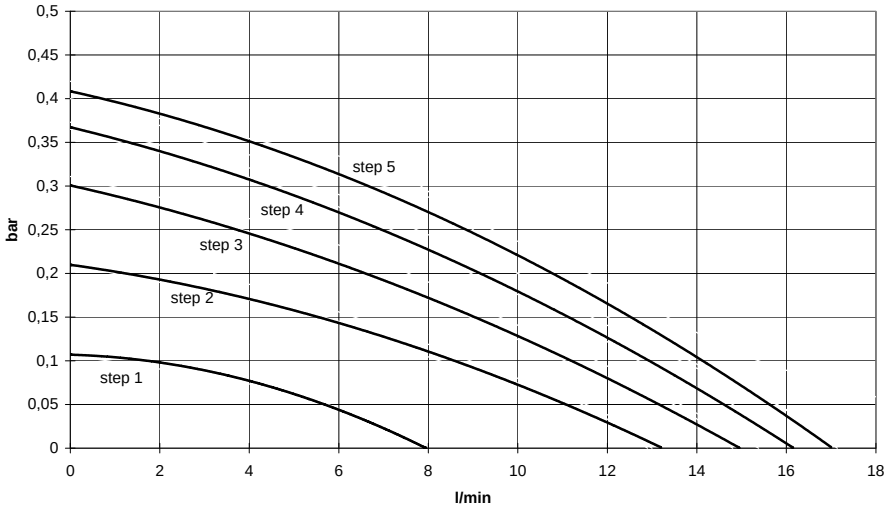
Power supply		Catalogue number				
		RE 206	RE 207	RE 210	RE 212	RE 220
230 V ±10 %; 50/60 Hz		LCK 0865	---	---	---	---
230 V ±10 %; 50 Hz		---	LCK 1868	LCK 1883	LCK 1871	LCK 1874
230 V ±10 %; 60 Hz		---	LCK 2868	---	LCK 2871	LCK 2874
115 V ±10 %; 60 Hz		LCK 4865	LCK 4868	LCK 4883	LCK 4871	LCK 4874
100 V ±10 %; 50/60 Hz		LCK 6865	LCK 6868	---	LCK 6871	LCK 6874
208 V ±10 %; 60 Hz		---	---	LCK 8883	---	---

We reserve the right to make technical alterations!

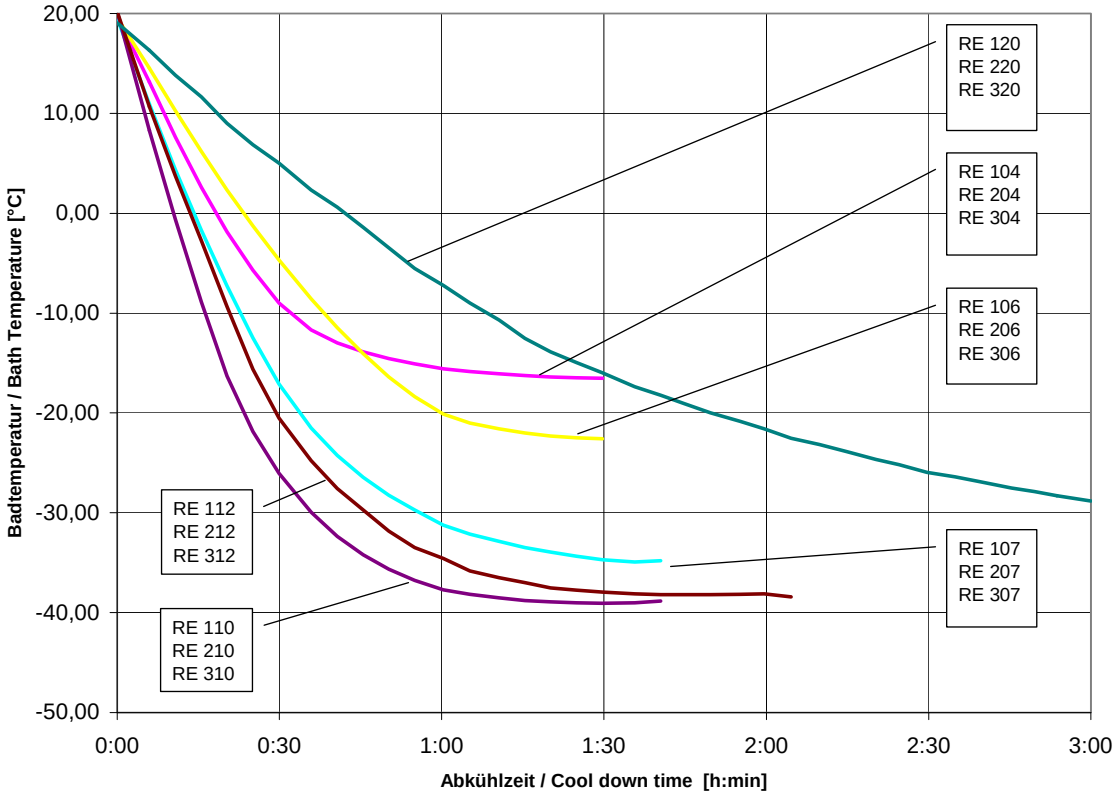
Standard settings of control parameters and pump (⇨ 7.4.4.1 and 7.4.4.2)

Unit Type	Xp (°C)	Tn (s)	Pump outflow step
RE 204	7.0	20	2
RE 205	8.5	40	3
RE 206	4.0	20	2
RE 207	3.0	25	3
RE 210	5.0	25	4
RE 212	4.5	30	4
RE 220	2.0	25	5

Pump characteristics
measured with water



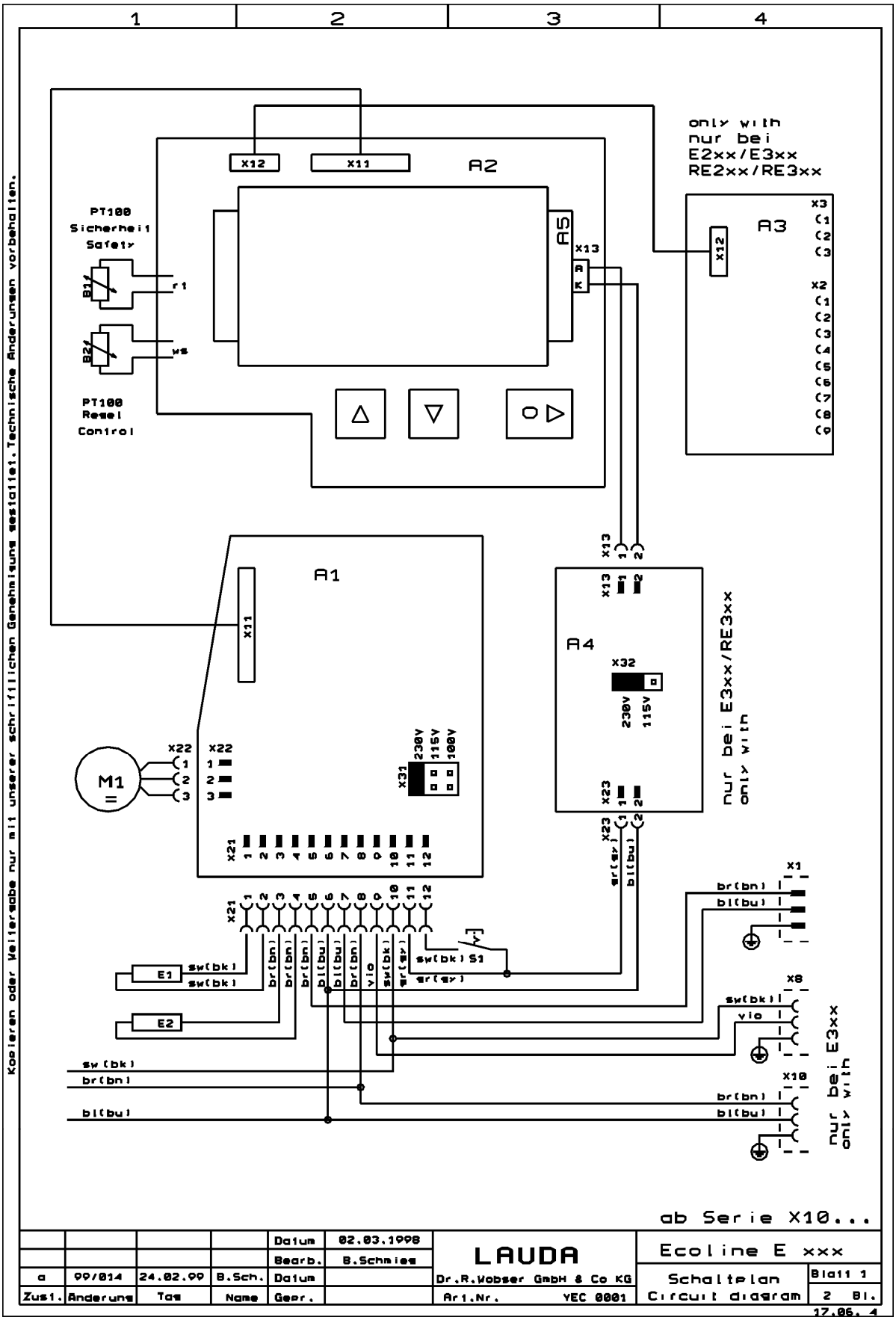
Cooling curves
measured with Ethanol

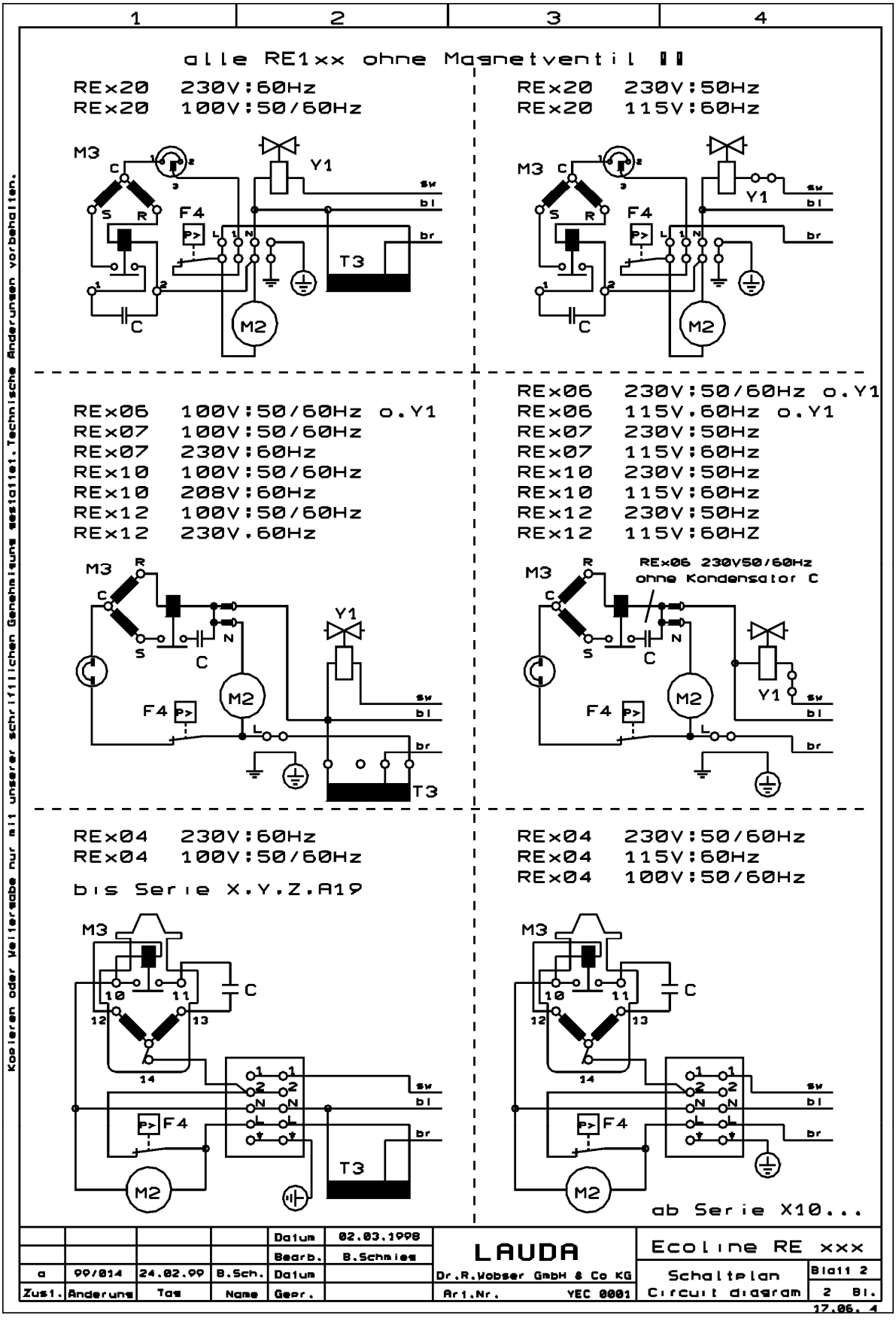


Bath liquid
water/ glycol 1:1
(to -25 °C) as bath liquid

Time from graph
= x1.7

11 Circuit diagrams




1
2
3
4
alle RE1xx ohne Magnetventil !!
RExx20 230V:60Hz
RExx20 100V:50/60Hz
RExx20 230V:50Hz
RExx20 115V:60Hz
RExx06 100V:50/60Hz o.Y1
RExx07 100V:50/60Hz
RExx07 230V:60Hz
RExx10 100V:50/60Hz
RExx10 208V:60Hz
RExx12 100V:50/60Hz
RExx12 230V.60Hz
RExx06 230V:50/60Hz o.Y1
RExx06 115V.60Hz o.Y1
RExx07 230V:50Hz
RExx07 115V:60Hz
RExx10 230V:50Hz
RExx10 115V:60Hz
RExx12 230V:50Hz
RExx12 115V:60HZ
RExx06 230V50/60Hz
ohne Kondensator C
RExx04 230V:60Hz
RExx04 100V:50/60Hz
bis Serie X.Y.Z.A19
RExx04 230V:50/60Hz
RExx04 115V:60Hz
RExx04 100V:50/60Hz
ab Serie X10...
M3
M2
Y1
T3
F4
C
sw
bl
br
Kopieren oder Weitergabe nur mit unserer schriftlichen Genehmigung gestattet. Technische Änderungen vorbehalten.
Datum 02.03.1998
Bearb. B.Schmies
LAUDA
Dr.R.Wobser GmbH & Co KG
Art.Nr. YEC 0001
Ecoline RE xxx
Schaltplan
Circuit diagram
Blatt 2
2 Bl.
a 99/014 24.02.99 B.Sch.
Zust. Änderung Tag Name
Gepr.
17.06. 4

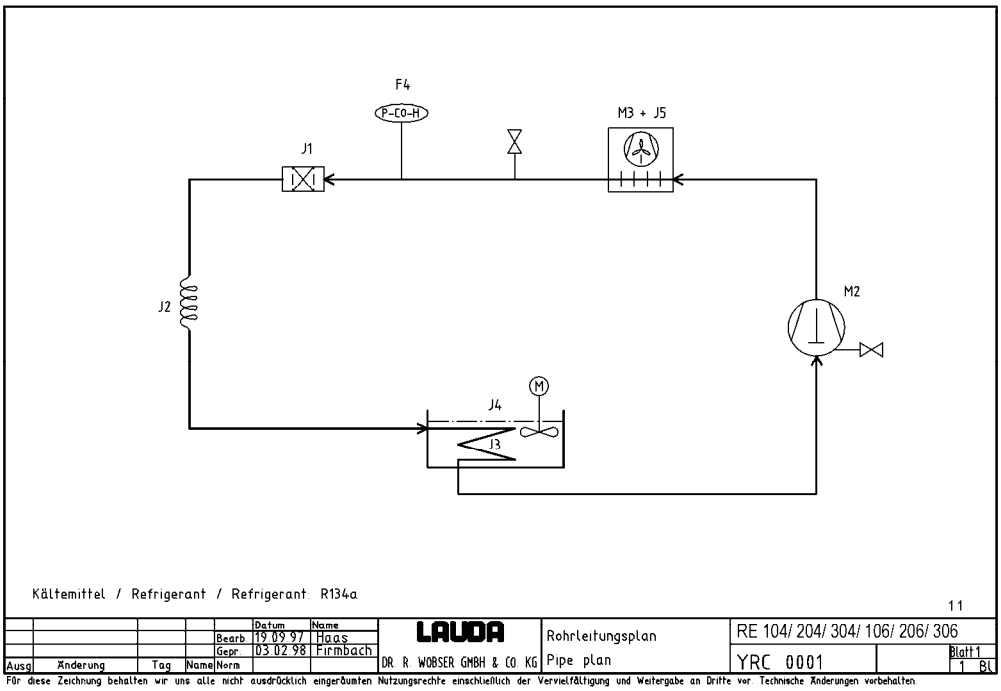
230V; 50Hz ◆ 230V 50/60Hz ◆ [230V; 60Hz] from serial number: 04-0001

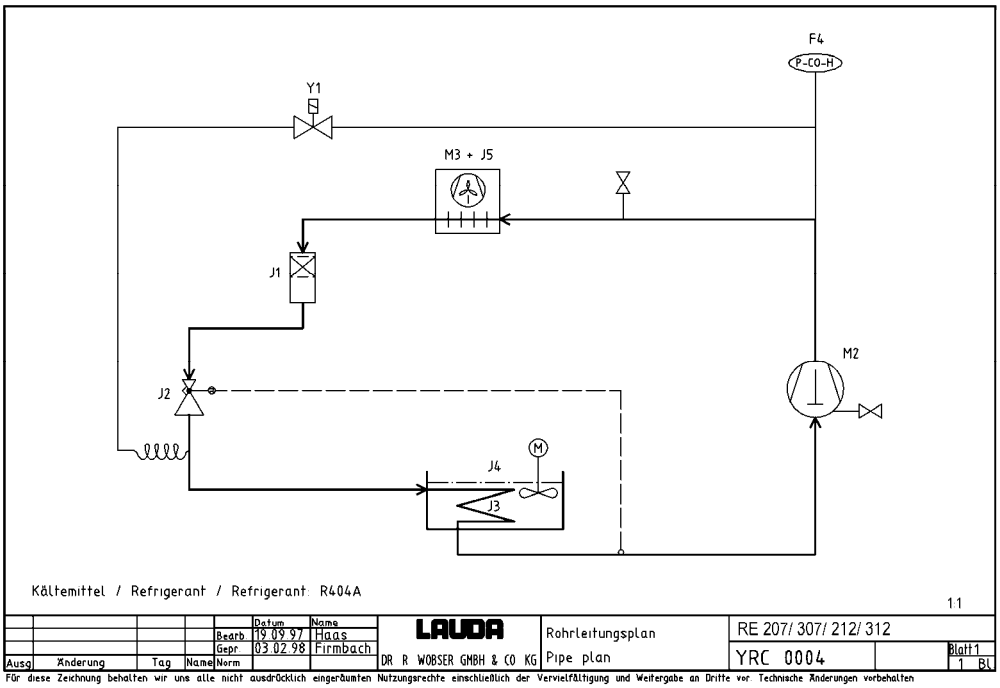
				RE 2xx
	A 1	Printed circuit board „Mains“		UL 487-1B
	A 2	Printed circuit board „Display“		UL 488-1B
	A 3	Printed circuit board serial interface RS 232/RS 485		UL 490
	A 4	Printed circuit board Mains LED-Backlight		----------
	A 5	Printed circuit board Display LED-Backlight		----------
	B 1	Pt100 probe safety circuit		ETP 057
	B 2	Pt100 probe actual value		
	E 1	Heater 1.5 kW		----------
	E 2	Heater 2.25 kW		EH 169
	M 1	Pump motor		EM 109
	S 1	Mains switch		EST 101
	U 3	SSR (BRT22H)	Y 1 output A1	---------
	X 1	Mains connection		EKN 001
	X 2	Lock screw		2x
	X 8	Connection socket Cooling (Stakei 2)		EQZ 048 EQK 004 EQZ 006
	X 10	Connection socket Cooling unit (Stakei 200)		EQD 037 EQZ 006
	X 13	Housing 2pol.		EQF 067
	X 21	Plug strip terminal 12pol.		EQF 079
	X 23	Line up terminal 2pol.		EZK 063
RE x04	F 4	Pressure switch		ES 045
	M 2	Compressor		EMV 050
	M 3	Fan		EML 052
RE x05	F 4	Pressure switch		ES 048
	M 2	Compressor		EMV 056
	M 3	Fan		EML 057
	U 3	SSR (BRT22H)	Y 1 output A1	---------
	Y 1	Solenoid valve		EVM 077
RE x06	F 4	Pressure switch		ES 045
	M 2	Compressor		EMK 186
	M 3	Fan		---------
RE x07	F 4	Pressure switch		ES 045
	M 2	Compressor		EMV 011
	M 3	Fan		EML 042
	U 3	SSR (BRT22H)	Y 1 output A1	---------
	Y 1	Solenoid valve		EVM 077
	[T 3	Transformer		EIT 125]
RE x10	F 4	Pressure switch		ES 048
	M 2	Compressor		EMV 056
	M 3	Fan		EML 057
	U 3	SSR (BRT22H)	Y 1 output A1	---------
	Y 1	Solenoid valve		EVM 077
RE x12	F 4	Pressure switch		ES 045
	M 2	Compressor		EMV 011
	M 3	Fan		EML 042
	U 3	SSR (BRT22H)	Y 1 output A1	---------
	Y 1	Solenoid valve		EVM 077
	[T 3	Transformer		EIT 125]
RE x20	F 4	Pressure switch		ES 045
	M 2	Compressor		EMK 146
	M 3	Fan		
	U 3	SSR (BRT22H)	Y 1 output A1	---------
	Y 1	Solenoid valve		EVM 077
	[T 3	Transformer		EIT 125]

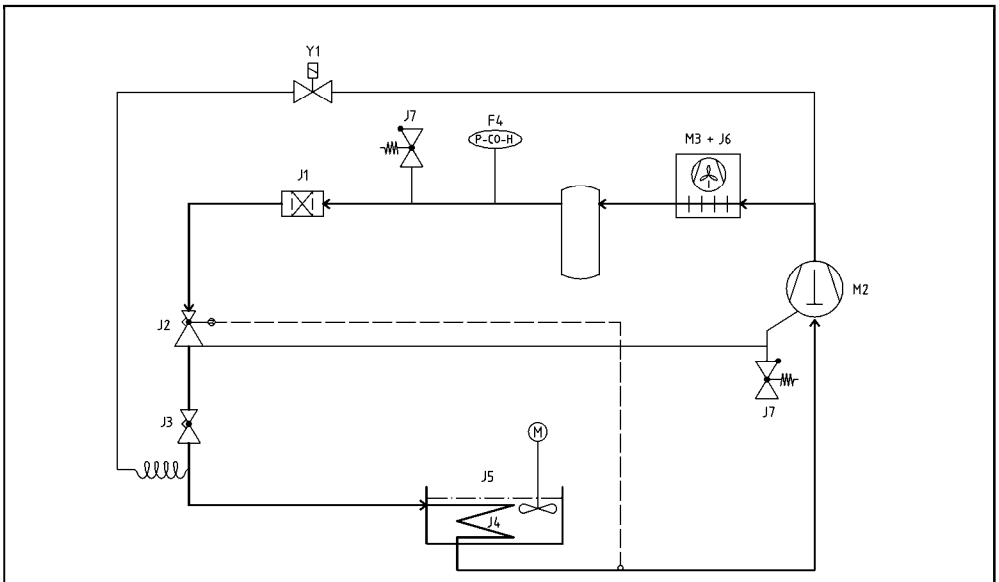
115V; 60Hz ◆ [100V; 50/60Hz] ◆ *208V; 60Hz* from serial number: 04-0001

				RE 2xx
	A 1	Printed circuit board „Mains“		UL 499
	A 2	Printed circuit board „Display“		UL 488-1B
	A 3	Printed circuit board serial interface RS 232/RS 485		UL 490
	A 4	Printed circuit board Mains LED-Backlight		---
	A 5	Printed circuit board Display LED-Backlight		---
	B 1	Pt100 probe safety circuit		ETP 057
	B 2	Pt100 probe actual value		
	E 1	Heater	1.3 kW at 115 V 1.0 kW at 100 V	EH 171
	M 1	Pump motor		EM 109
	S 1	Mains switch		EST 101
	U 3	SSR (BRT22H)	Y 1 output A1	---
	X 1	Mains connection		EKN 003
	X 2	Lock screw		2x EQZ 048
	X 8	Connection socket Cooling (Stakei 2)		EQK 004 EQZ 006
	X 10	Connection socket Cooling unit (Stakei 200)		EQD 037 EQZ 006
	X 13	Housing 2pol.		EQF 067
	X 21	Plug strip terminal 12pol.		EQF 079
	X 23	Line up terminal 2pol.		EZK 063
RE x04	F 4	Pressure switch		ES 045
	M 2	Compressor		EMV 049
	M 3	Fan		EML 051
RE x05	F 4	Pressure switch		ES 048
	M 2	Compressor		EMV 055
	M 3	Fan		EML 056
	U 3	SSR (BRT22H)	Y 1 output A1	---
	Y 1	Solenoid valve		EVM 079
RE x06	F 4	Pressure switch		ES 045
	M 2	Compressor		EMK 187
	M 3	Fan		---
	[T 3	Transformer		EIT 122]
RE x07	F 4	Pressure switch		ES 045
	M 2	Compressor		EMV 012
	M 3	Fan		EML 033
	U 3	SSR (BRT22H)	Y 1 output A1	---
	Y 1	Solenoid valve		EVM 079
	[T 3	Transformer		EIT 122]
RE x10	F 4	Pressure switch		ES 048
	M 2	Compressor		EMV 055
	M 2	*Compressor*		EMV 057
	M 3	Fan		EML 056
	M 3	*Fan*		EML 057
	U 3	SSR (BRT22H)	Y 1 output A1	---
	Y 1	Solenoid valve		EVM 079
	Y 1	*Solenoid valve*		EVM 077
RE x12	F 4	Pressure switch		ES 045
	M 2	Compressor		EV 012
	M 3	Fan		EML 033
	U 3	SSR (BRT22H)	Y 1 output A1	---
	Y 1	Solenoid valve		EVM 079
	[T 3	Transformer		EIT 122]
RE x20	F 4	Pressure switch		ES 045
	M 2	Compressor		EMK 181
	M 3	Fan		
	U 3	SSR (BRT22H)	Y 1 output A1	---
	Y 1	Solenoid valve		EVM 079
	[T 3	Transformer		EIT 122]

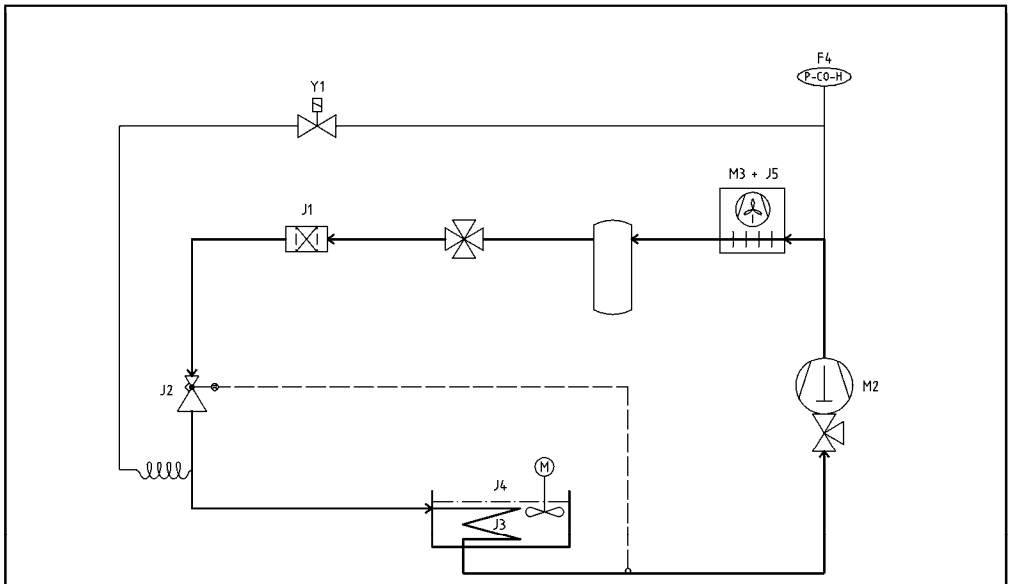
12 Pipe plan


F4
P-CO-H
M3 + J5
J1
J2
M2
M
J4
J3
Kältemittel / Refrigerant / Refrigerant: R134a
1:1
Datum
Name
Bearb 19.09.97 Haas
Gepr 03.02.98 Firmbach
Norm
Ausg Änderung Tag Name
LAUDA
DR. R. WOBSER GMBH & CO. KG
Rohrleitungsplan
Pipe plan
RE 104/ 204/ 304/ 106/ 206/ 306
YRC 0001
Blatt 1
1 Bl.
Für diese Zeichnung behalten wir uns alle nicht ausdrücklich eingeräumten Nutzungsrechte einschließlich der Vervielfältigung und Weitergabe an Dritte vor. Technische Änderungen vorbehalten.


F4
P-CO-H
Y1
M3 + J5
J1
J2
M2
M
J4
J3
Kältemittel / Refrigerant / Refrigerant: R404A
1:1
Datum
Name
Bearb 19.09.97 Haas
Gepr 03.02.98 Firmbach
Norm
Ausg Änderung Tag Name
LAUDA
DR. R. WOBSER GMBH & CO. KG
Rohrleitungsplan
Pipe plan
RE 207/ 307/ 212/ 312
YRC 0004
Blatt 1
1 Bl.
Für diese Zeichnung behalten wir uns alle nicht ausdrücklich eingeräumten Nutzungsrechte einschließlich der Vervielfältigung und Weitergabe an Dritte vor. Technische Änderungen vorbehalten



Für diese Zeichnung behalten wir uns alle nicht ausdrücklich eingeräumten Nutzungsrechte einschließlich der Vervielfältigung und Weitergabe an Dritte vor. Technische Änderungen vorbehalten.



Für diese Zeichnung behalten wir uns alle nicht ausdrücklich eingeräumten Nutzungsrechte einschließlich der Vervielfältigung und Weitergabe an Dritte vor. Technische Änderungen vorbehalten.

230V; 50Hz ◆ 230V 50/60Hz ◆ [230V; 60Hz] from serial number: 04-0001

RE 204	F 4	Pressure switch	ES 045
	M 2	Compressor	EMV 050
	M 3	Fan	EML 052
	J 1	Drier	EO 003
	J 2	Capillary	HKA 114
	J 3	Evaporator	----------
	J 4	Bath	----------
RE 205	F 4	Pressure switch	ES 048
	M 2	Compressor	EMV 056
	M 3	Fan	EML 057
	J 1	Filter drier / receiver	EO 044
	J 2	Injection valve	EVE 128
	J 3	Injection valve	EVE 135
	J 4	Evaporator	----------
	J 5	Bath	----------
	J 6	Condenser	EOW 089
	Y 1	Solenoid valve	EVM 077
RE 206	F 4	Pressure switch	ES 045
	M 2+M 3+J 5	Cooling unit	EMK 186
	J 1	Drier	EO 003
	J 2	Capillary	HKA 114
	J 3	Evaporator	----------
	J 4	Bath	----------
RE 207	F 4	Pressure switch	ES 045
	M 2	Compressor	EMV 011
	M 3	Fan	EML 042
	J 1	Filter drier / receiver	EO 040
	J 2	Injection valve	EVE 111
	J 3	Evaporator	----------
	J 4	Bath	----------
	J 5	Condenser	EOW 085
	Y 1	Solenoid valve	EVM 077
	[T 3	Transformer	EIT 125]
RE 210	F 4	Pressure switch	ES 048
	M 2	Compressor	EMV 056
	M 3	Fan	EML 057
	J 1	Filter drier / receiver	EO 044
	J 2	Injection valve	EVE 128
	J 3	Injection valve	EVE 135
	J 4	Evaporator	----------
	J 5	Bath	----------
	J 6	Condenser	EOW 089
	Y 1	Solenoid valve	EVM 077
RE 212	F 4	Pressure switch	ES 045
	M 2	Compressor	EMV 011
	M 3	Fan	EML 042
	J 1	Filter drier / receiver	EO 040
	J 2	Injection valve	EVE 111
	J 3	Evaporator	----------
	J 4	Bath	----------
	Y 1	Solenoid valve	EVM 077
	[T 3	Transformer	EIT 125]
RE 220	F 4	Pressure switch	ES 045
	M 2+M 3+J 5	Cooling unit	EMK 146
	J 1	Drier	EO 041
	J 2	Injection valve	EVE 112
	J 3	Evaporator	----------
	J 4	Bath	----------
	Y 1	Solenoid valve	EVM 077
	[T 3	Transformer	EIT 125]

115V; 60Hz ◆ [100V; 50/60Hz] ◆ *208V; 60Hz* from serial number: 04-0001

RE 204	F 4	Pressure switch	ES 045
	M 2	Compressor	EMV 049
	M 3	Fan	EML 051
	J 1	Drier	EO 003
	J 2	Capillary	HKA 114
	J 3	Evaporator	----------
	J 4	Bath	----------
RE 205	F 4	Pressure switch	ES 048
	M 2	Compressor	EMV 055
	M 3	Fan	EML 056
	J 1	Filter drier / receiver	EO 044
	J 2	Injection valve	EVE 128
	J 3	Injection valve	EVE 135
	J 4	Evaporator	----------
	J 5	Bath	----------
	J 6	Condenser	EOW 089
	Y 1	Solenoid valve	EVM 079
RE 206	F 4	Pressure switch	**ES 045**
	M 2+M 3+J 5	Cooling unit	EMK 187
	J 1	Drier	EO 003
	J 2	Capillary	HKA 114
	J 3	Evaporator	----------
	J 4	Bath	----------
	[T 3	Transformer	EIT 122]
RE 207	F 4	Pressure switch	**ES 045**
	M 2	Compressor	EMV 012
	M 3	Fan	EML 033
	J 1	Filter drier / receiver	EO 040
	J 2	Injection valve	EVE 111
	J 3	Evaporator	----------
	J 4	Bath	----------
	J 5	Condenser	EOW 085
	Y 1	Solenoid valve	EVM 079
	[T 3	Transformer	EIT 122]
RE 210	F 4	Pressure switch	ES 048
	M 2	Compressor	EMV 055
	M 2	*Compressor*	*EMV 057*
	M 3	Fan	EML 056
	M 3	*Fan*	*EML 057*
	J 1	Filter drier / receiver	EO 044
	J 2	Injection valve	EVE 128
	J 3	Injection valve	EVE 135
	J 4	Evaporator	----------
	J 5	Bath	----------
	J 6	Condenser	EOW 089
	Y 1	Solenoid valve	EVM 079
	Y 1	*Solenoid valve*	*EVM 077*
RE 212	F 4	Pressure switch	ES 045
	M 2	Compressor	EMV 012
	M 3	Fan	EML 033
	J 1	Filter drier / receiver	EO 040
	J 2	Injection valve	EVE 111
	J 3	Evaporator	----------
	J 4	Bath	----------
	Y 1	Solenoid valve	EVM 079
	[T 3	Transformer	EIT 122]
RE 220	F 4	Pressure switch	ES 045
	M 2+M 3+J 5	Cooling unit	EMK 181
	J 1	Filter drier	EO 041
	J 2	Injection valve	EVE 112
	J 3	Evaporator	----------
	J 4	Bath	----------
	Y 1	Solenoid valve	EVM 079
	[T 3	Transformer	EIT 122]

BESTÄTIGUNG / CONFIRMATION / CONFIRMATION

An / To / A:
LAUDA Dr. R. Wobser • LAUDA Service Center • Fax: +49 (0) 9343 - 503-222

Von / From / De :

Firma / Company / Entreprise: _____

Straße / Street / Rue: _____

Ort / City / Ville: _____

Tel.: _____

Fax: _____

Betreiber / Responsible person / Personne responsable: _____

Hiermit bestätigen wir, daß nachfolgend aufgeführtes LAUDA-Gerät (Daten vom Typenschild):
We herewith confirm that the following LAUDA-equipment (see label):
Par la présente nous confirmons que l'appareil LAUDA (voir plaque signalétique):

Typ / Type / Type :	**Serien-Nr. / Serial no. / No. de série:**

mit folgendem Medium betrieben wurde
was used with the below mentioned media
a été utilisé avec le liquide suivant

_____

_____

_____

_____

Darüber hinaus bestätigen wir, daß das oben aufgeführte Gerät sorgfältig gereinigt wurde, die Anschlüsse verschlossen sind, und sich weder giftige, aggressive, radioaktive noch andere gefährliche Medien in dem Gerät befinden.

Additionally we confirm that the above mentioned equipment has been cleaned, that all connectors are closed and that there are no poisonous, aggressive, radioactive or other dangerous media inside the equipment.

D'autre part, nous confirmons que l'appareil mentionné ci-dessus a été nettoyé correctement, que les tubulures sont fermées et qu'il n'y a aucun produit toxique, agressif, radioactif ou autre produit nocif ou dangeureux dans la cuve.

Stempel **Seal / Cachet.**	**Datum** **Date / Date**	**Betreiber** **Responsible person / Personne responsable**

LAUDA DR. R. WOBSER GmbH & Co. KG
Pfarrstraße 41/43
D - 97922 Lauda-Königshofen
Internet: http://www.lauda.de
Tel: +49 (0)9343 / 503-0
Fax: +49 (0)9343 / 503-222
E-mail: info@lauda.de